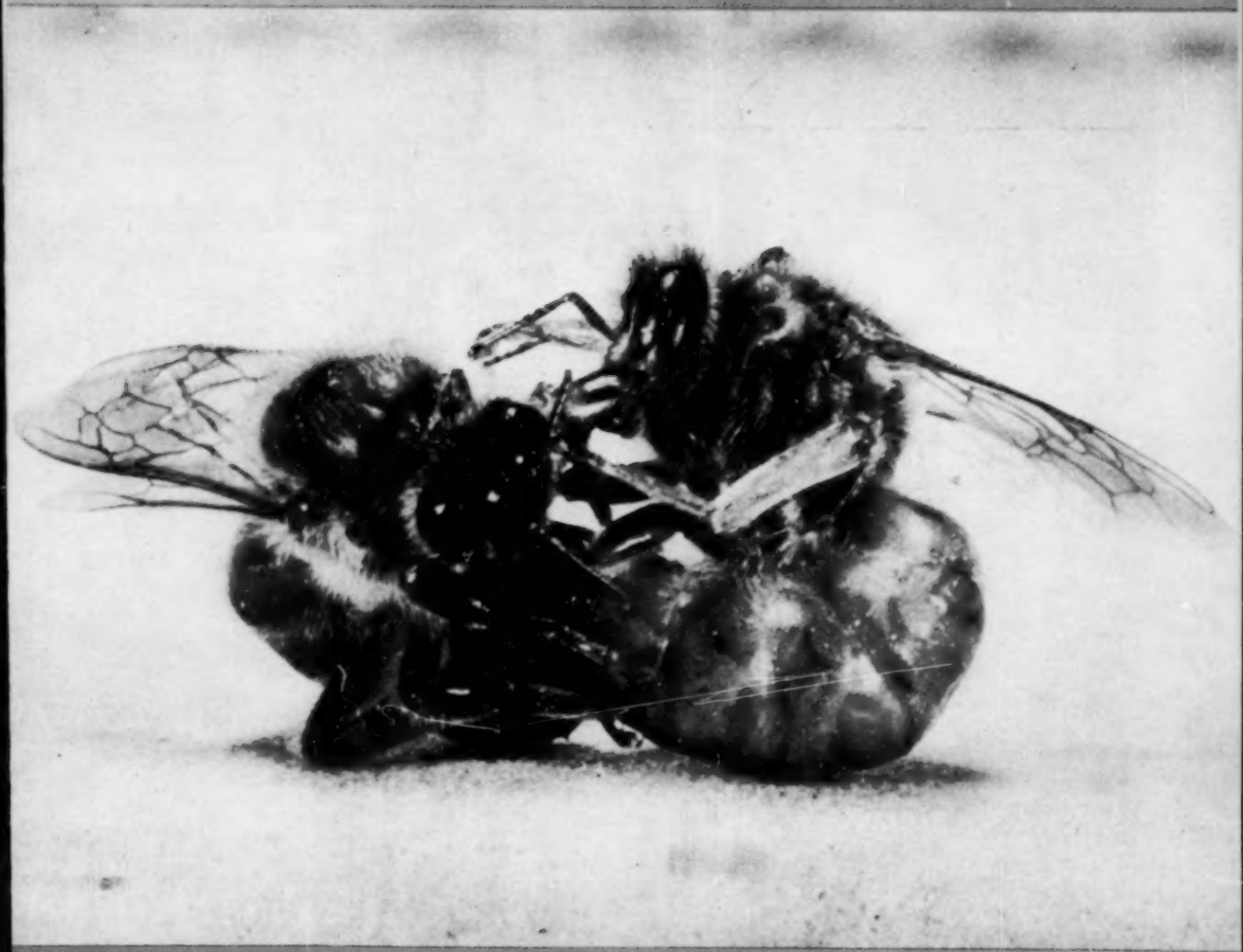
American Bee Journal



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March 1961 Vol. 101 No. 3

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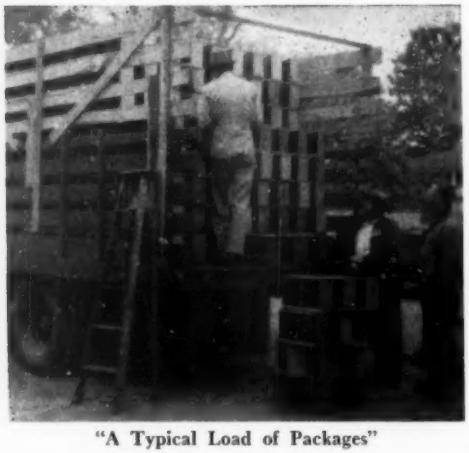

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MAY - 1961

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JUNE - 1961

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Hamilton, Illinois

Vol. 101, No. 3 March, 1961

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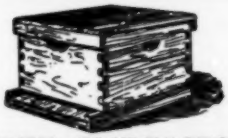
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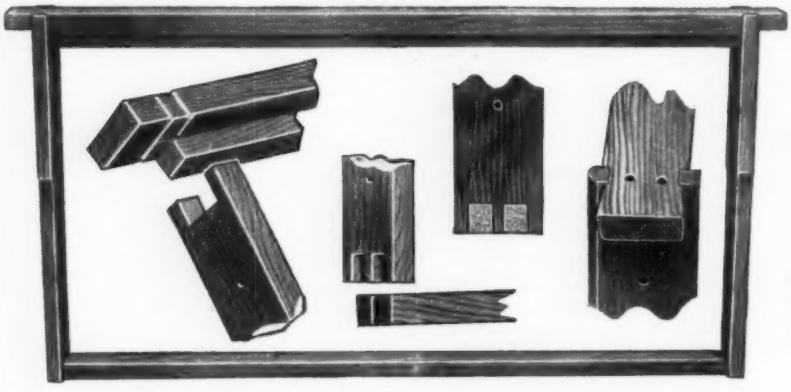
THE COVER PICTURE— Treat Davidson produced a rare one again with this picture of two queens fighting. When you look at it try to imagine the patience it required to get such a setting. Many of us have seen this battle but it required a "stage hand" to turn a couple of potential enemies loose in the right spot for the camera to record the fight. (Just had a card from Treat. He was then in Casablanca on a picture taking jaunt and aboard the Gripsholm.)



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Apicultural Science

Editor, DR. WALTER C. ROTHENBUHLER
Iowa State University
Ames, Iowa

Dr. Rothenbuhler is best known for his research in the genetics of the honey bee. Walter is a young man with an abundance of enthusiasm and forward thinking. He is one of the few geneticists in the world concentrating on the inheritance and genetical patterns in the honey bee. His evaluations of the scientific material in the Journal stamp these presentations with dependable critical approval.

Recent Advances in Pest Control that Provide Better Protection for Honey Bees

by GEORGE D. PETERSON, JR.
Agricultural Extension Service,
University of California, El Centro

"Bees are so important in agriculture and so important to so many of us that we cannot afford to destroy them along with the harmful insects."

This is the opening paragraph of an article entitled "Insecticides and Bees" which appears in the 1952 Yearbook of Agriculture.

Food and fiber, however, are so important that we cannot afford to let our crops be unduly injured by pests. It would be wonderful, indeed, if natural control agencies could take care of all our pest problems so that we would have no need for chemical control measures.

Unfortunately, this is not possible. Natural control or more specifically, biological control, has its limitations like any other method. There are certain situations where biological control may be sufficient to secure adequate control of a crop pest. Frequently, however, we find it necessary to apply pesticides or face the loss of our crops.

Since chemicals are, in the light of our present knowledge, indispensable to adequate crop protection against insect pests and mites, we find we have two problems to solve — how to achieve effective control of our insect enemies while preventing undue destruction of honey bees as well as other beneficial insects.

The honey bee is susceptible to most of the pesticides used in commercial pest control programs including both stomach and contact poisons as well as fumigants. Damage to individual colonies and apiaries is widespread and may be severe in areas where pesticides are extensively used.

This chemical destruction of bees represents a very considerable monetary loss to beekeepers. Thousands of colonies are destroyed or seriously weakened each year wherever large quantities of pesticides are applied.

Beekeepers often find it necessary to move their bees to new locations because of the hazards of poisoning. Not uncommonly, this results in overcrowding the flower sources in those areas and reducing the honey secured by local bees as well as the imported ones. Thus, the problems of one area create problems in another.

On a number of occasions in the past, certain agricultural pesticides were responsible for severe losses to the apicultural industry. Fortunately, these losses have been minimized by corrective legislation and improved pest control techniques and materials. However, a great number of new pesticides—many of them highly toxic to bees—have appeared on the market in recent years, and additional compounds are developed each year.

It is imperative that these new compounds be studied to determine their relative toxicity to honey bees. Laboratory and field trials designed to test the effects of these chemicals on bees are a regular part of the pesticide evaluation program of the University of California.

Loss of honey bees, for whatever reason, means a loss in pollination. When we consider that at least fifty important crops grown in California are dependent to a large degree on

honey bees for pollination, it is readily apparent that severe loss of bees from pesticide poisoning can mean a serious reduction in yield of these crops.

Moreover, the repeated use of pesticides may result in the destruction of many insect pollinators other than the honey bee. This loss of "natural" pollinators increases the need for the honey bee which is the chief insect that man can use for pollination purposes.

Without the honey bee, cantaloupe and melon growers would have no crop to harvest. Producers of alfalfa seed and other seed crops would have very poor seed set without bees to pollinate their plants. As everyone knows, our deciduous fruit crops are dependent upon bees for pollination.

The farmer, therefore, should be as vitally concerned with the protection of bees as is the beekeeper, for conservation of bees will put extra dollars in his pocket at harvest time to say nothing of the goodwill he will reap from the beekeeper! While it is true that for many years only a relatively small number of farmers recognized the importance of the honey bee, farmers are becoming increasingly aware of the essential role played by bees in the production of their crops. Most farmers today readily concede the beekeeper his rightful place in agriculture.

The pesticide salesman and the commercial applicator also have a vital stake in this problem. Their livelihood depends on a healthy, productive farm industry. If their farmer customers do not make money, their own profits dwindle. Most commercial pesticide personnel recognize, too, the importance of good public relations and strive to do the very best job of pest control possible.

Important as is this matter of protecting honey bees against the adverse effects of pest control programs, it is only a part of a still larger and far more complex problem—how to provide adequate chemical control of crop pests without unduly endangering the intricate system of natural or biological controls.

It is shortsighted to develop a chemical control program for the suppression of one insect pest in a crop and ignore the impact of that program on the other insects, both beneficial and harmful, that may be present. It would be equivalent to attempting to utilize natural enemies to control the pest in the face of imminent economic damage to the crop or without proper consideration of the need for chemical control of other pests attacking the crop.

Chemical and biological control are two principal methods of combatting insect pests and mites. Most people think that these two methods are not compatible, that they cannot be made to work together successfully. They are regarded by most people as alternatives in pest control. Either the farmer chooses to "let nature do it" and takes his losses philosophically when nature fails to measure up, or he applies his chemicals — sometimes indiscriminately — and the parasites, predators, and bees must win if they can.

This type of thinking is as obsolete as the Model T. The day when we could apply a pesticide to a field with complete disregard of the highly complex biological society occupying that field is long past. Indeed, some of the most serious pest problems we face today have resulted in large measure from the comparatively narrow thinking and poor practices of the past.

Recently, there has developed in California a new concept of pest control. Entomologists call this new approach "integrated control."

The dictionary defines integration as "the act or operation of integrating; the bringing together of parts into a whole." Thus, it follows that when we speak of integrated control we have reference to some process or method of operation whereby we combine various factors each of which, by itself, offers some measure of pest control.

Integrated control integrates chemical and biological control. It takes a wide view of pest problems, considers long-term trends of pest and beneficial insect populations, and relates these to the characteristics of the crop, farming practices, and economic factors.

This new concept resulted from attempts to develop a suitable control for the spotted alfalfa aphid. We found that low dosages of Systox would effectively control the aphid without seriously affecting the parasites and predators which attack the aphid or other pests of alfalfa. Most of these beneficial insects survive and persist on the low aphid population remaining after treatment.

Progressing from the successful integration of chemical and biological control of the spotted alfalfa aphid, we undertook research designed to bring the entire alfalfa pest complex under an integrated control program. For most practical purposes this has been achieved. Investigations are now underway to determine the possibilities for integrated control in other crops — cotton and sugar beets, for example.

There are a number of requirements essential to the success of integrated control.

1) The farmer must know what the population densities of the pest and its principal natural enemies are. Moreover, he should know what these populations were a week, two weeks, or even a month ago. In short, he should know the *trend* in insect populations in his field.

2) He must know the economic threshold of the pest, i.e., the population density at which chemical control measures should be determined to prevent an increasing pest population from reaching the level where economic injury to the crop would result — the point at which chemical treatment will return a profit. And he must be familiar with proper sampling methods so that he can accurately estimate insect populations to determine if his field requires treatment.

3) The farmer must know which material he should use to secure adequate control of the pest while assuring the least possible injury to beneficial insect populations including honey bees. He must also select the pesticide both with respect to the length of time remaining until harvest and the legal tolerance for residue of the chemical on the harvested crop.

Admittedly, this is a difficult and time-consuming job, one that may require more time and attention than the farmer can devote to it. If a farmer cannot check his own fields, we suggest that he enter a supervised control program. Under this system a farmer or a group of farmers employ a qualified entomologist to follow the insect and mite populations and make recommendations concerning the control of these pests.

This helps to eliminate unnecessary treatments, and chemical control measures are made more effective through better timing. The beneficial insect populations are also evaluated, and full advantage is taken of those that are present. Control measures are tailored for the conditions prevailing in each field.

A fourth essential of integrated control might be termed "selective chemical control." Selectivity may be attained in two ways — by applying a nonselective chemical in such a way and at such time or dosage level that its effect on beneficial insects is minimized, or by applying a pesticide which is more or less specific against the pest that must be controlled and

does not kill its natural enemies.

Systox, at the low dosages recommended for control of the spotted alfalfa aphid, kills some lady beetles and other enemies of the aphid but permits most of these beneficial insects to survive. At these low dosages, Systox has little effect on bees. On the other hand, high dosages of Systox are lethal to most parasites and predators and could result in heavy loss of bees if applied to crops in bloom — alfalfa, for example.

Nonselective materials which have short residual action when applied to crops may be used where protection for beneficial insects which can survive in a resistant stage is desirable. An example is Phosdrin which is recommended for control of the spotted alfalfa aphid close to cutting time when Systox cannot be used because of the danger of excessive residues on the hay. Parasites of the aphid, which spin their pupal cocoons inside the dead bodies or "mummies" of the aphids, will survive a Phosdrin treatment. The short activity of this compound makes it possible for the adult parasites to emerge from the cocoons safely even an hour or so after treatment. Lady beetles and other beneficial insects may safely enter the field shortly after treatment. The same is true for foraging bees.

Insects, like other animals and man, are susceptible to a variety of infectious diseases; millions of insects die from these diseases each year. Although it is an important part of natural control, most of this mortality goes unnoticed.

Occasionally, outbreaks of insect disease are so spectacular as to attract considerable attention among farmers as well as entomologists. Examples familiar to many California farmers are the outbreaks of fungus diseases of the spotted alfalfa aphid, pea aphid, and green peach aphid and the virus disease that frequently eliminates heavy populations of cabbage looper from cotton in late summer.

Entomologists and other persons concerned with the control of crop pests have long been interested in the possibility of utilizing insect diseases much as we use chemicals to effect commercial control of pests in the field. This interest has persisted since disease organisms were first detected in insects many years ago.

Scientists have completed the first big step in perfecting the commercial use of insect disease organism against crop pests. A bacterial insecticide, *Bacillus thuringiensis*, has advanced from the research laboratory into commercial production. The commercial production and use of this biotic insecticide constitutes a major break-through in crop pest control. Its successful development has been achieved by the insecticide industry largely as a result of basic research conducted during the past decade by the Laboratory of Insect Pathology at the University of California.

This disease-producing material shows considerable promise for the control of various caterpillars which attack truck and field crops in California. Experiments conducted by University of California entomologists at Riverside and Davis have shown that *Bacillus thuringiensis* has but slight effect on bees. It appears equally harmless to other beneficial insects.

In conclusion, it should be pointed out that integrated control is not a cure-all to be applied blindly to all situations; it will not work if biological control agents are inadequate or if chemical controls are not utilized with skill and good judgment. Neither will integrated control nor the use of selective pesticides prevent all damage to apiculture.

Integrated control and selective pesticides should be recognized for what they are — highly useful tools for some appropriate situations.

The Domination of Bumble Bees by Honey Bees

FRANCIS O. HOLMES

Dr. Holmes, with the Rockefeller Institute has a farm in Henniker, New Hampshire.

When bumble bees are numerous, as they were during the past summer on the writer's farm in Henniker, New Hampshire, we often see them working together with honey bees, on what appears superficially to be a basis of equality. Wasps may also work among them. Often, however, we see only bumble bees and wasps operating as though the plants on which they are then working are not attractive to honey bees, at least at the moment of observation.

Do we ever see honey bees working on flowers that are regularly unattractive to nearby bumble bees? Rarely, if ever. This suggests that the apparent equality of honey bees and bumble bees on crops that attract them both may be unreal.

Several years ago the writer exposed some frames of honey on a specially constructed stand in a windy spot to see what insects would be attracted to it. Wasps, honey bees and bumble bees soon found the honey and worked steadily to obtain the valuable stores. On nearby flowers such bees remained well dispersed and showed no tendency to jostle each other. When a mixed crowd of individuals had gathered on a restricted area of the comb honey, however, the different kinds did not get on well together. Differences between the groups began to become evident.

Whenever a wasp met a honey bee or a bumble bee, the honey bee or bumble bee retreated. Whenever, a honey bee met a bumble bee, the bumble bee retreated. There were but few wasps present and they did not greatly affect the behavior of the other insects. Finally the honey bees and bumble bees worked separate sides of the exposed frames, the honey bees dominating the sheltered side of the frames the bumble bees congregating on the more peaceful but windier side.

The tendency of bumble bees to leave crowded areas whenever they met honey bees probably led to their staying for longer periods on the windier side than on the sheltered side of the frames of honey. They would naturally tend to remember the sites where they had worked most and to return to them more and more often.

Perhaps the willingness of bumble bees to work contentedly in windier locations is related to their tendency to work earlier and later in the day than honey bees do. We may assume that our Italian-type honey bees are as yet less hardy in respect to cold and wind than some bumble bees.

Our honey bees, however, must now be undergoing natural selection for hardiness, at least in northern locations. Colonies composed of slightly longer working variants would seem likely to store more abundant supplies of food for winter and thus to survive better on the average, or to store so much more honey for beekeepers as to be favored by them in current breeding procedures. Early-and-late-working colonies of honey bees might well be noted carefully to determine whether they really are better than less active ones. If so, artificial selection might hasten the appearance of a new and valuable characteristic. A word of caution is needed, though. Conceivably, working too early or too late might lead to chilling of field bees and to losses of working forces that would be unfavorable despite the lengthening of daily working periods. Foolhardiness in bees may be no better than the same characteristic in human beings.

The writer remembers only one case in which honey bees seemed to be attracted to a crop in abundance but without accompanying bumble bees. This case involved the blossoms of the showy sedum *(Sedum spectabile* Boreau). Honey bees were numerous and busy on the pink sedum flowers one day last September, but no bumble bees were observed working with them. Nearby were beds of asters (Michaelmas daisies) on which both honey bees and bumble bees were working together. This was in the New York Botanical Garden in Bronx Park, New York City. Elsewhere in New York City, in an area where no honey bees occurred on any of the flowers that usually attract them, the same kind of sedum flowers not only *did* attract bumble bees but individual flowerheads held the attention of single bumble bees for periods as long as 60 to 70 seconds at a time. Can it be that the relation between bumble bees and honey bees on flowers is like that on a frame of honey, the bumble bees working on less favorable crops rather than on crops where there would be frequent meetings with honey bees? The aster beds at the Botanical Garden were watched carefully for possible collisions between bees but no such meetings were observed. Perhaps the bumble bees and honey bees work together only when, or principally when, their populations are sparsely distributed. Does this mean that a crop on which both are working is yielding moderately, one attracting only bumble bees is yielding slightly, one attracting only honey bees is yielding heavily, and one attracting neither is yielding little or nothing? The condition must be satisfied, of course, that both honey bees and bumble bees are active in the vicinity. Experiments to confirm or refute such a hypothesis must be devised.

European Foulbrood

by L. BAILEY, Rothamsted Experimental Station
Harpenden, England

In this article I describe the natural history of European foulbrood (EFB) as I interpret it from observations and experimental work at Rothamsted Experimental Station (Bailey, 1959, 1960) and elsewhere.

The course of disease in colonies

Death of unsealed larvae is the sign usually considered typical of EFB (Fig. 1). The course of the disease in a colony is notoriously variable, but the sudden death of many larvae followed by a spontaneous recovery of the colony a few weeks later is common. It is widely held that spontaneous recovery occurs when nectar flows begin (Grout, 1949) but it is more accurate to say recovery begins when flows are well advanced. Acute outbreaks of disease in naturally infected, but otherwise normal, colonies at Rothamsted actually started when nectar flows were just beginning, and recovery began when the flow reached its peak or had even begun to decline. The same seemed true of the only case of EFB reported from the tropics (Smith, 1958), and, as I learned on a visit last spring, outbreaks in various parts of the United States and Canada behave similarly. Dr. G. H. Cale informed me that outbreaks in Mexico coincided with the start of the nectar flow in November and again between March and May - the time of the latter flow being rather variable. As I hope to explain, it may be more enlightening to regard acute outbreaks of disease as being coincident with rapidly growing brood nests rather than with the start of nectar flows. Although colonies below full size usually grow quicker than full-sized ones during nectar flows (Simpson 1959), they do not always do so. For example, in Mexico there is a flow from sunflowers in January but brood rearing remains low and no EFB occurs (Dr. G. H. Cale, personal communication) and in Southern Japan the main nectar flow is about April or May but EFB is maxi-

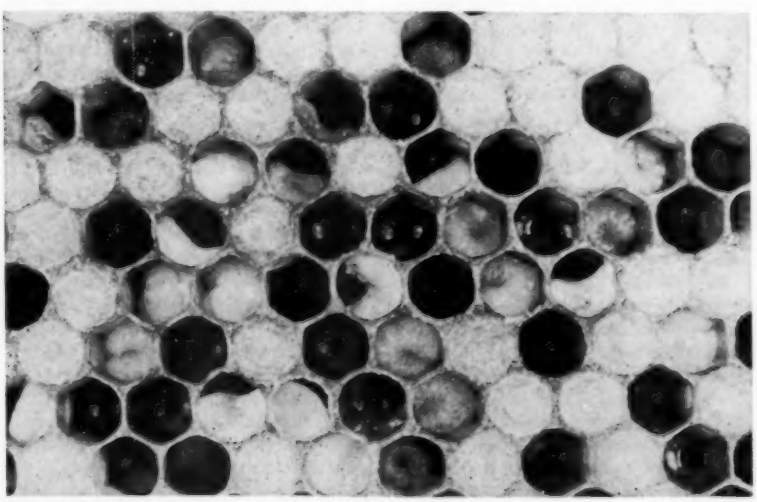

Figure 1. Honey bee larvae with European foulbrood disease. (Photograph by P. S. Milne).

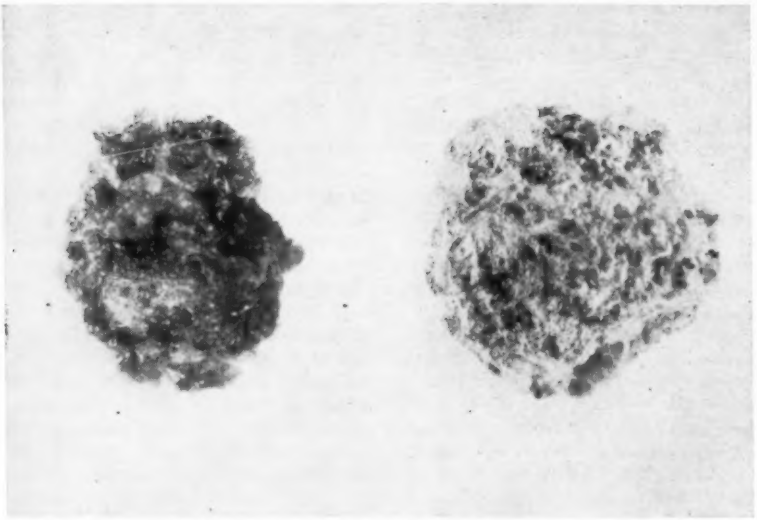

Figure 2. **LEFT:** dark capping, smeared with viable **Streptococcus pluton**, as found on cells containing infected larvae that successfully pupate. **RIGHT:** normal capping. (Photograph by P. S. Milne)

mal about a month later when colonies are reaching full size (Dr. Y. Hachinohe, personal communication).

The course of infection in individual larvae

To understand the above events it is necessary to consider the course of infection in an individual larva by the organism that causes European foulbrood - an oval, rather pointed bacterium, *Streptococcus pluton* (White). This organism has recently been cultivated artificially and shown to cause EFB (Bailey, 1959b). *S.pluton* grows entirely within the gut cavity: it does not invade the living tissues and it stops growing if the larva dies. An important point, not generally realized, is that infected larvae do not necessarily die: many successfully pupate and emerge as adults. When the sac like mid-gut of the larva becomes joined to the rectum before pupation, the mid-gut contents, in which *S.pluton* has been growing, are voided in the faeces. Thus *S.pluton* is deposited in the cell, and very often these cells can be identified, as was found originally by Baumgartner at Liebefeld, Switzerland, by their dark cappings (Fig. 2) which carry heavy deposits of *S.pluton*. These bacteria are alive, and probably remain so for many years as we have cultivated *S.pluton* from dry smears of larval mid-guts stored at room temperature for 3 years. Infected larvae that manage to survive are underweight and spin thinner cocoons than usual, no doubt because of food lost to the mass of bacteria growing in the gut.

As may be expected, larvae that are infected late in their unsealed life are less likely to be affected, or to develop as many bacteria, than those infected earlier. Larvae that are infected when very young are likely to die or to be ejected by adult bees, but this removes the bacteria in that larva from the colony. It is true that newly dead larvae easily rupture, and bacteria may be disseminated by adult bees that try to remove the semi-liquid remains, but most infected larvae are removed before this messy stage has been reached or they often seem to be deliberately left by bees until they have dried to a scale, except perhaps in heavily diseased colonies. A scale is then easily removed with the bacteria embedded in it.

The cause of disease outbreaks

It is possible to picture a balance attained in an infected colony between the production of bacteria, mostly from infected larvae that survive, and their elimination by cell-cleaning bees, with an insignificant number of young larvae becoming heavily infected and being ejected by adult bees. Infection could persist in this way for many years and beekeepers may notice little or no obvious disease, until this balance is upset.

Experiments (Bailey, 1960), have shown how this may happen. Colonies suddenly deprived of much of their unsealed brood kept more infected larvae than usual, but more infected larvae than usual were ejected if unsealed brood was suddenly added. The most obvious explanation is that, when many unsealed larvae were removed, a sudden surplus of glandular brood food from nurse bees was created and more infection could then be supported with this excess of protein food. [It has been shown (Gontarski, 1953; Simpson, 1958) that larvae receive surplus food when much brood is removed.] When brood was added there was a sudden shortage of glandular food so that bees ejected larvae, and the infected larvae were ejected preferentially. There is evidence that events like these happen naturally and that outbreaks of disease occur in colonies that have changed suddenly from a state of restricted brood rearing to one of rapid growth. When infected colonies start to grow early in the season some sort of balance probably exists as described above, between development and elimination of bacteria. When inclement weather or other events interrupt nectar flows in spring or early summer, growth of colonies is usually checked, and *S.pluton* can then accumulate if larvae receive surplus glandular food, because more infected larvae survive and void bacteria in their faeces than before. At this stage there may be little sign of disease: at Rothamsted almost half the larvae from a colony with no sign of disease were found to be heavily infected with *S.pluton* immediately before the main nectar flow was due to begin, about mid-June. Larvae that have died after they have been sealed, and sometimes dead pupae, often occur in colonies at this stage and if the situation were prolonged mortality would probably become more noticeable. But outbreaks with very many visibly diseased larvae do not happen. Larvae too heavily infected to mature are presumably quickly ejected by adult bees. As soon as the main nectar flow begins, however, and brood rearing increases, many infected larvae may then lack the surplus glandular food necessary for survival. These larvae may die suddenly, faster than adult bees can eject them, and so a typical outbreak is caused. This occurred in the colony just mentioned and, as it coincided with outbreaks in general, it is most likely that all the colonies concerned were similarly heavily infected just before the nectar flow.

Secondary infections

Secondary bacteria add some complications. *Bacterium eurydice* (White) has invariably been found in larvae with EFB disease at Rothamsted. This rod-shaped organism lives primarily in the alimentary canal, particularly anterior to the mid-gut of adult bees. It is most abundant in summer, probably because of its ability to grow well in a watery extract

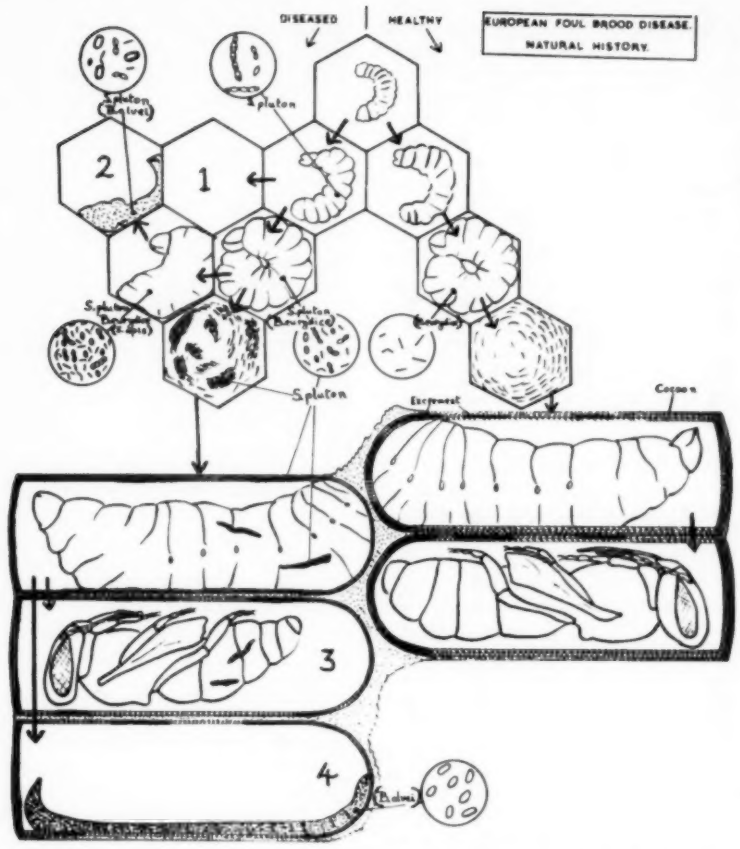

Figure 3. A diagram showing the possible fates of infected larvae and associated bacteria.

1. Infected larvae may be detected before they are fully grown and be ejected by nurse bees. At this stage **S.pluton** is likely to be in almost pure culture.
2. Larvae may be almost fully grown and then die and form a scale. Although infection may now be multiple only **S.pluton** and **B.alvei** remain alive for long in the dried scale.
3. Larvae may pupate and form undersized adults. Of the bacteria voided in their faeces only **S.pluton** remains alive.
4. Larvae or prepupae may die after they have voided most bacteria from their intestines, but **B.alvei** can grow in the dead tissue and the scale contains mostly this organism.

Names of bacteria are given where the organisms are alive, although the larval stage indicated may contain cells of the other commonly associated organisms, (shown in the relevant inset diagram), which have died. Names in parenthesis indicate bacteria that are not always to be found.

of pollen gathered by bees. It finds its way in great quantities to freshly collected pollen and from there to larvae either directly or via nurse bees. By itself it causes no apparent harm, but circumstantial evidence indicates that it accelerates the death of larvae already infected with *S.pluton*. It quickly dies in larvae that have died and in the faeces of infected larvae that successfully pupate. It is susceptible, like *S.pluton*, to the antibiotics terramycin and streptomycin and, in artificial culture, to penicillin. Another commonly associated organism is *Bacillus alvei*, at one time strongly favored as the cause of EFB, but it grows mostly in larvae that are already dead. It forms oval spores that can be dormant for years and it generally becomes established in colonies chronically infected with EFB. *Streptococcus faecalis ("S.apis")*, which looks rather like *S.pluton*, is common in certain districts in diseased larvae and may accelerate their death, in much the same way as does *B.eurydice*, but it seems unable to survive for great lengths of time in bee colonies and is probably brought into colonies from outside sources. It does not cause disease by itself.

Fig. 3 illustrates the possible fates of larvae with EFB and the associated bacteria.

Recovery from disease

As outbreaks of visible disease increased in the experimental colonies at Rothamsted, the proportion of newly infected larvae did not increase; indeed they sometimes declined before visible disease reached its peak. This could only mean that transmission of *S.pluton* was decreasing. The most obvious explanation is that many larvae were dying and being ejected by adult bees and that the bacteria they contained were being rapidly eliminated. Thus, acute outbreaks of disease usually seem to be self-limiting and colonies recover.

Sometimes colonies die or are severely crippled by disease. Enormous numbers of *S.pluton* must build up in these colonies and kill a major portion of the brood, particularly when the colony tries to increase brood rearing. A self-perpetuating decline may set in as more glandular food becomes available to keep the surviving larvae alive and so allow them to produce even more bacteria. The brood nest may also be choked with decomposing remains that are removed before they have become dry scales. Any attempt by the colony to increase brood rearing would probably lead to further large-scale losses of larvae.

EFB rarely occurs after midsummer. This may be largely because most colonies have eliminated most infected larvae by that time, but several investigators have found difficulty in infecting colonies by experimental inoculation with virulent *S.pulton* after midsummer, so there seems to be a fundamental change in susceptibility of colonies. Bees are much less tolerant of brood towards the end of the season - as might be expected when brood nests are contracting before the winter - and abnormal larvae, such as those infected with *S.pluton* are detected and ejected with great efficiency. Glandular food may become less as bees begin to retain food reserves in their bodies for the winter period. Exceptionally, and perhaps helping to prove the rule, EFB outbreaks sometimes occur in autumn if good nectar flows occur, when brood rearing probably increases again.

Field observations

The above interpretation of EFB outbreaks seems compatible with field observations. For example, small colonies would grow relatively quicker than large ones in the same favorable conditions and this may explain the prevalence of disease among "weak" colonies. Prolific queens are said to produce resistant colonies and this may be because their brood nests remain larger, in proportion to the

number of nurse bees, than those of less prolific queens, particularly in adverse circumstances, and their infected larvae are more likely to be ejected. Diseased colonies that are near to starving have been noticed to lose all sign of disease, probably because they eject larvae, and infected ones would be ejected first. Methods of beekeeping that suppress brood rearing, or that keep a small amount of brood relative to nurse bees, may be expected to cause *S.pluton* to increase, and trouble occurs with disease in colonies of this kind, such as those used for producing queen cells or royal jelly. EFB is frequently experienced in S. New Jersey after colonies have been used to pollinate blueberry from the first two weeks in April to the last 2 weeks in May. The colonies develop well, and afterwards, mainly to facilitate handling, the colonies are divided and then requeened and moved elsewhere. In effect this suddenly creates small colonies in which brood rearing is probably checked by the handling and moving; and in July, when brood nests are probably growing quickly again, the colonies often suffer outbreaks of EFB.

Methods of Treatment

Before antibiotics were used a method was advocated of treating diseased colonies in which queens were removed and the colonies requeened - preferably with newly mated queens, after being queenless for periods of a few days to 3 weeks. (Sturtevant, 1920; Phillips, 1921). This may have appeared successful, but most infection may already have been eliminated during the outbreak of disease (the success after removing queens for only a few days suggests this), and, with the new queens, colonies may have subsequently maintained larger brood nests than usual, which would have caused more infected larvae to be ejected. The possibility that such treatment could eliminate all infection seems remote, and the queenless period was probably detrimental, as we now know that queenless colonies keep more infected larvae than those with queens.

Several antibiotics, particularly terramycin and streptomycin, effectively suppress EFB, but disease frequently recurs in treated colonies, particulary in subsequent years. It follows that the antibiotics check but do not eliminate infection. Disease outbreaks may be cut short by antibiotic treatment but *S.pluton* may then not be so effectively eliminated by ejection of infected larvae as is usual. Treated colonies may, therefore, have as much if not more residual infection afterwards than if they had been allowed to recover spontaneously. It seems more logical to apply antibiotics at times when *S.pluton* may be accumulating, before the usual time for acute outbreaks of disease. Colonies found affected by disease at the usual time, after such treatment, must be grossly contaminated with dormant bacteria (which are probably unaffected by antibiotics), and it may well be economical to destroy them. Colonies with few dormant bacteria remaining would suffer little disease and would probably eliminate much of the residual infection when brood rearing increased.

Conclusion

EFB is a disease caused by an organism that is closely adapted to the life of its host and can survive indefinitely in the bee colony without causing a great deal of damage. In localities with uninterrupted nectar flows, where colonies can grow unhindered each year, disease may not be apparent. But modern agriculture often limits the seasonal range of available flora, crops are changed from year to year, cut when in bloom, or bees are moved from one region to another. These severe alterations of the environment of the honey bee, as well as some beekeeping practices, cause *S.pluton* to increase at times and lead to serious outbreaks of disease.

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The Bee Louse in Tasmania

The bee louse, *Braula Coeca*, is almost universally distributed throughout Tasmania, so much so that there is an embargo on the export of our bees to the Australian mainland.

Infection rates are much higher in black bees; Italians seem nearly immune. The lice do little damage except when they congregate on a queen. I have removed as many as 35 from a single queen. The effect of such an acute parasitic irritation is to cause a serious falling off in the queen's egg laying. Holding the queen for half a minute in the smoke from a cigarette soon delouses her. We use no other treatment.

D. G. Cunningham,
Stock and Apiary Inspector,
Devonport

Research Grant to the Punjab

USDA announces, among others, a research grant of $34,663.00 for a five year term to the Agricultural College and Research Institute, Ludhiana, Punjab, to support a study of the acarine disease problems in honey bees

Zinc in Royal Jelly

Appearing in the Journal of the Faculty of Science of Tokyo in November, 1960, is an article by Minoru Osanai entitled "Zinc in Royal Jelly of the Honeybee."

Mr. Osanai found that there is a quite high concentration of zinc in royal jelly, whether it is from larvae only three or four days old or of older ones. This special food with high concentration of royal jelly stimulates the development of the ovaries of the queen bee. Probably this zinc is largely directly traceable to pollen since, the first few days of the life of the worker its food consists mostly of pollen, which stimulates the growth also of the worker bee.

Zinc content of the larva of the queen bee is high at the start, recedes in the middle of its growth and again accelerates near the end of the larval stage. With the worker bee, high at first, it plays a less and less role to the end.

Colony Weight Changes — One and Twenty Years

V. G. MILUM, Department of Horticulture, University of Illinois

One who keeps colonies of bees in the same location for a number of years eventually learns that all years are not alike so far as total honey production is concerned. This total is variable because of methods of management, variations in individual colonies and differences in the weather conditions. To learn these variations, keeping records of daily gains and losses of weight by means of an average representative colony on scales is invaluable and is strongly recommended. While the records presented herewith may not correspond to those of another area, they will serve to give some idea of what may happen from year to year under somewhat comparable conditions.

The records of the change in weight of a colony covering 20 years, 1930 to 1948, inclusive, and 1955 are shown in figure 1, except in portions of some years when the records were not complete. This record is of a colony in the University of Illinois 40- to 50-colony apiary at Champaign-Urbana, Illinois. The colony was maintained in a 1½ - story Modified Dadant hive for wintering and managed for extracted honey production using a partial modified Demaree system. The apiary was located in the heart of the two cities at the edge of the University of Illinois campus which provided some open expanse for white Dutch clover which was mowed frequently. The two cities were traversed by two railroad right-of-ways, one approximately 0.5 mile distant and the other 0.7 mile away. The former provided some sweet clover pasturage within a mile radius while sweet clover in any quantity along the latter was beyond 1.5 miles. The bounds of the city were approximately 1 mile north and south, and a variable 2 or more miles east and west. While there was apparently some surplus flow from sweet clover, the bulk of the crop probably came from white Dutch clover blooming abundantly in lawns of city homes and the larger areas of the University grounds, especially in years of frequent rains during the blooming period. There was some evidence that a part of the flow in some years may have come from soy bean fields a mile or more away. Honeydew apparently added to the flow, or at least prevented or reduced the loss of weight, during July and August of some dry years. In one year in the early 50's, not included in the records, at least a super of honeydew was stored by some colonies. It is apparent that beekeepers are not always aware of this fact, especially when bees are kept in areas where aphids may be abundant on elm and oak trees.

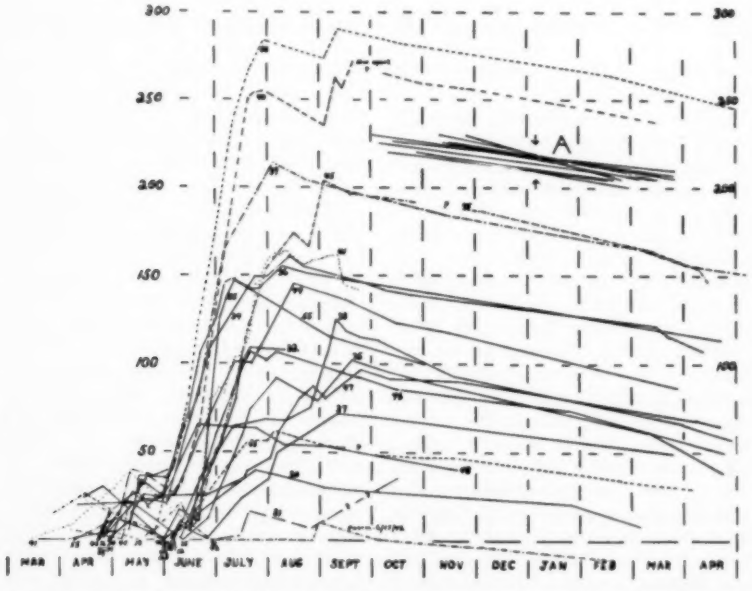


Fig. 1. — Weight changes of a honey bee colony over a period of 20 years, 1930-1948, and 1955, as listed in table 1. The lowest weight of each year (spring or summer) is reduced to zero and recorded on a common base line, except 1942. The upper peak of each line is the cumulative total of the respective yearly weight gain. The group of lines at A represents the corresponding period of winter decline for all years grouped for purposes of comparison.

Table 1 (page 94) shows the variations in the dates of and amounts of the lows and highs of the total net weight of the colony for each of the three yearly periods, spring, summer and fall, with the winter loss or consumption of stores being indicated in the loss column of the spring period. Although, in the spring, the loss of weight in stores is partly made up or replaced by the weight of the increasing brood, considering the overall picture, it seems reasonable to assume that the total of the gains from spring to fall, less the losses during the winter and spring and the two periods between honeyflows, actually represents the approximate surplus honey from year to year. Thus, for the 20 years there was an indicated yearly average gain of 85 pounds.

A critical study of figure 1, will clearly indicate that the lowest weight of each year does not always occur at the end of the winter period. If there is a spring honeyflow from early blooming shrubs, fruit trees, and dandelion, the lowest point will be during the last two weeks in April

Table 1.—Twenty years' weight changes[a] of a honey bee colony at Champaign-Urbana, Illinois. 1930–1948, 1955.

	Spring				Summer				Fall			
	Low		High		Low		High		Low		High	
Year	Date	Loss	Date	Gain	Date	Loss	Date	Gain	Date	Loss	Date	Gain
1930	—[b]	—	—	—	May 31	—	July 27	39	Aug. 25	6	Sept. 8	3
1931	Apr. 2	27	—	—	July 2	3	18	16	24	10	—	—
1932	6	—	—	—	June 8	6	19	114	10	4	—	—
1933	15	24	June 3	—[c]	5	4	10	58	11	+2	13	60
1934	28	64	May 22	23	2	2	23	126	6	2	Aug. 13	16
1935	11	53	11	3	11	22	Aug. 6	92	28	13	Sept. 19	23
1936	23	63	12	27	May 21	9	July 7	130	July 22	7	Aug. 9	14
1937	21	41	11	2	June 4	7	Aug. 5	49	—	—	Sept. 11	24
1938	Mar. 24	24	Apr. 18	—	May 15	7	2	284	Sept. 3	11	11	17
1939	Apr. 29	39	May 16	39	24	3	3	178	Aug. 24[d]	10	11	−10
1940	May 6	41	21	37	June 7	9	July 29	230	Sept. 3	20	20[e]	19
1941	Mar. 14[e]	29	10	38	17	32	Aug. 11	160	Aug. 24	11	10[f]	10
1942	Apr. 23[f]	26	Apr. 30	14	May 25	10	June 10	15	26	22	Aug. 31	10
1943	—	—	15	—	June 1	12	July 19	57	July 28	2	4	7
1944	Apr. 4	37	May 18	25	2	4	12	80	22	2	16	46
1945	Mar. 26	58	Apr. 19	12	May 28	26	Aug. 6	160	Aug. 20	8	Sept. 15	37
1946	Apr. 13[g]	41	25	6	29[h]	30	July 20	107	July 29	5	Aug. 5	5
1947	24	61	May 17	33	31	8	18[i]	14	Aug. 2	8	Sept. 24	57
1948[j]	22	42	15	27	27	7	June 20	42	8	12	7	−2
1955	9[k]	29	3	13	31	12	July 12[l]	145	—	—	Nov. 1	−46[l]
Variations:												
	Loss		*Gain*		*Loss*		*Gain*		*Loss*		*Gain*	
Dates	Mar. 14–May 6		Apr. 19–May 22		May 15–June 17		June 10–Aug. 11		July 22–Sept. 3		Aug. 4–Sept. 24	
Pounds	24 to 63		2 to 39		2 to 32		14 to 284		−2 to 22		−10 to 60	
Average[m]	−40 (17)		+21 (14)		−11 (19)		+105 (20)		−10 (19)		+20 (17)	

[a] The pounds of gain or loss indicated in each column are the differences between the dates of that column and the next preceding column, except the date preceding the first spring date is the one listed in the last column for the preceding year. For example, the 1930–1931 winter loss of 27 pounds is for the period from September 8, 1930 to April 2, 1931.

Variations and discrepancies in the records are indicated as follows:

[b] Incomplete records.

[c] Colony queenless April 15, 1933; new colony substituted June 3.

[d] No fall flow.

[e] Colony upset in windstorm, badly demoralized, winter loss recorded from October 7.

[f] Apparently partly robbed after examination September 10, plus errors in records; winter loss from February 18 to April 23 only.

[g] Winter loss from December 6 only.

[h] Same on June 7.

[i] Colony queenless June 4, 1947; requeened, may have swarmed in a good honey year.

[j] 1948, a year of very small surpluses, the total loss from June 20 to November 24 being 26 pounds.

[k] Colony established on scales, December 30, 1954.

[l] No fall flow.

[m] Figures in parentheses are numbers of years included in averages, i.e., those with complete records for the respective periods; the cumulative annual average was 85 pounds of surplus.

or early May in central Illinois. If there is no such spring honeyflow due to cold or stormy weather preventing flight of bees and thus access to the flowers, then the low point in colony weight may occur in June, before the start of the summer honeyflow. If we examine the curves for the 20 years, it will be noted that the two alternatives mentioned above are about equally divided between the two sets of conditions. It is these variable conditions that the beekeeper must be prepared to cope with; to provide additional stores if needed under adverse spring conditions, or to reduce swarming by adequate supering if colonies are becoming crowded for storage room during a good spring honeyflow.

To supplement the information on the record of 20 years, let us consider the record of another year, that of 1959, as shown in table 2. This scale colony was a Caucasian housed in a Modified Dadant hive in a 45-colony apiary, located about 300 yards outside the city limits (1.5 miles from the 20-year location), where it was within flying distance of a large acreage of fruit trees and of an abundance of early blooming shrubs, trees, and flowers, and later of white Dutch clover and some sweet clover during the summer honeyflow. However, the spring blooming period was unfavorable for colony activity because of continued rain and cold, with the majority of the colonies having to be fed additional stores over the winter provisions. The colony, for which the record is shown, was actually placed on scales on May 16, with the gains and losses thereafter being listed by groups according to the type of weather. No substantial gains are indicated until the first week in June, quite common for this area (see also figure 1.), when the main flow is from white Dutch clover. The abundant rainfall 1.08 inches, of June 11, appears to have triggered the good honeyflow that followed, while the two days of cold, June 13-14, and the strong winds of June 26, 27, certainly acted as deterrents. Omitting these four days and counting the gain for the remaining 15 days between June 12 and June 30, a total gain of 157.5 pounds is noted, with an average daily gain of 10.5 pounds, the maximum being 14.5 pounds on June 20, with maximum and minimum temperatures of 88 and 63 being recorded for the latter date. Although, this heavy honeyflow is by no means the greatest average ever recorded, it should serve as a warning, especially to beginners, as to supering wisely and sufficiently. With honey coming in at a rate of 10.5 pounds daily, what can a crowded colony do with only a super, perhaps a shallow, for storage space. And this big gain went through a queen ex-

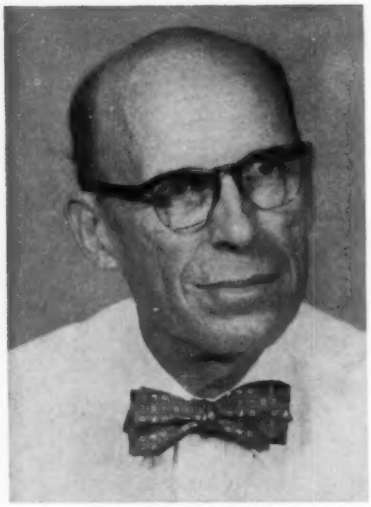
Table 2. Record of an extracted honey colony in 1959

Dates	Temp Max.	Temp Min.	Rain-Inches	Sky	Net gain	Daily Low	Daily High
5/16–5/29	54–86	39–67	4.43(10)	Cldy (13)	4.5	-1	1.5
5/30–6/1	78–88	54–66	0.00	Cldy (3)	9.0	-.5	5.5
6/2–6/8	75–92	51–67	0.00	Clear (7)	33.0	1.0	11.5
6/9–6/10	81–86	67–67	Tr.	Pt. Cldy	7.5	1.5	6.0
6/11	81	68	1.08	Cldy	4.0	(4.6 m. wind)	
6/12	90	68	0.00	Clear	10.0	(5.3 m. wind)	
6/13–6/14	72–78	47–52	0.00	Clear	-1.5	(8.8–3.9 m. wind)	
6/15	84	61	Trace	Pt. Cldy	11.0	(4.9 m. wind)	
6/16	81	47	0.00	Clear	11.5	(5.8 m. wind)	
6/17	88	56	0.00	Clear	9	(5.7 m. wind)	
6/18	78	57	0.00	Cldy	10.0	(4.3 m. wind)	
6/19	82	61	0.00	Pt. Cldy	10.0	(2.8 m. wind)	
6/20	88	63	0.00	Pt. Cldy	14.5	(3.4 m. wind)	
6/21	93	66	0.00	Pt. Cldy	13.5	(5.5 m. wind)	
6/22	85	62	Trace	Pt. Cldy	12.0	(6.-5 m. wind)	
6/23	87	59	0.00	Pt. Cldy	8.5	(4.2 m. wind)	
6/24	90	67	0.00	Pt. Cldy	13.5	(5.5 m. wind)	
6/25	94	71	Trace	Pt. Cldy	10.0	(9.0 m. wind)	
6/26	93	75	0.00	Pt. Cldy	4.5	(10.2 m. wind)	
6/27	94	73	0.00	Clear	3.5	(12.0 m. wind)	
6/28	96	74	0.00	Clear	7.5	(11.2 m. wind)	
6/29	97	69	Trace	Pt. Cldy	10.0	(6.7 m. wind)	
6/30	92	63	0.01	Pt. Cldy	6.5	(5.4 m. wind)	
7/1–7/7	80	53	Tr.(1)	Clear (6)	17.5	-1.5	5
7/8–7/17	93	58	0.05	Clear (3)	25.5	0.0	6
7/18–8/6	95	60	0.77	Clear (1)	31.0	av.	1.55
5/16–8/6	—	—	—	Total gain	299.0 pounds		
8/7–8/31	93	60	2.25	Clear (4)	-11.5		
9/1–9/8	71–92	56–69	0.39	Clear	+13		
9/9–10/6					-13.5		

cluder, which apparently didn't act much as a "honey excluder."

Let us check our records for the previous year, June 12 to 30, 1958, the corresponding period of the good flow of 1959. The total weight gain for the scale colony for this 19 days was only 40 pounds with 5.5, 9.0, 5.5 and 8 (28) occurring on the last four days of clear weather. All of the earlier 15 days were recorded as cloudy or partly cloudy, 11 of which had maximum temperatures between 71 and 74° F., the others 77, 81, 82, 85° F., while the daily lows varied between 50 and 61 for the whole period. Coupled with low temperatures and not favorable for good honeyflows, were 10 of 15 days with some rain, totaling 3.34 inches. There also was a total of 3.65 inches in the preceding four days. While occasional light rains or heavy rains with extended intervening rainless periods along with warm weather are conducive to good honeyflows when honey plants are abundant, one can expect a relatively poor honeyflow with extended cold and rainy weather.

With the record crop in 1959, what were we to expect in 1960? The rainy and cool weather of 1958 had stimulated the growth of new white clover plants for 1959. Then with rain in 19 days in May, 1959, totaling 4.43 inches, white clover was ready for a bounteous bloom and nectar yield. The 1.08 inches on June 11, served as only a temporary delay to the flow and there was a bumper crop. But what about the new clover plants, the ones that should produce the new crop in 1960? It is stated, and correctly, that for biennial honey plants, such as clovers, to produce well, an abundance of rain is needed in July, August and September of the first year, plus good winter protection of a snow cover for the clovers, plus good rainfall in the spring previous to the honeyflow. Let us check again on the 1959 rainfall. After the good rain of July 11, from June 12 to July 22, 41 days in all, there was a total of only 0.24 inches on 5 days with a trace on 6 days. This is the period when the seed for the 1960 clover plants should have been germinating, with the plants thereafter establishing strong root systems for wintering and vigorous growth in the spring of 1960. But, with the lack of rain from June 12 to July 22, conditions were unfavorable for new plants. Along with this lack of honey plants (white Dutch and sweet clover) in 1960, the situation was not helped by the fact that at the peak of the usual honeyflow period, there were 14 days of rain, totaling 4.59 inches, in the 20 days from July 11 to July 30. While the scale colony showed a net gain of 59 pounds after deducting a winter and spring net loss of 52 pounds, the average for the 50 - colony apiary over winter stores was slightly better than 30 pounds, compared to better than 230 pounds of extracted honey per colony in 1959. But beekeepers can be optimistic and look to the future. While the abundance of moisture did not help with the 1960 crop, it should be helpful for 1961. New clover plants should be plentiful and with the continuing snow cover, 1961 should again bring up the average which is really what counts.



Honey Bees in Production of White Clover Seed in the Southern States

by E. OERTEL
Entomology Research Division[1]

Pollinating insects are necessary for the production of white clover seed. Certain wild bees, principally bumble bees and solitary bees, pollinate white clover *(Trifolium repens L.)*, but their number is small. Honey bees (*Apis mellifera* L.) are by far the most numerous pollinating agents, and their number in an area can be increased by moving colonies to the field.

Large fields of clover present a big job of pollination. An acre of white clover may contain from 1 to 3 million open florets per day during the flowering season, which, in the Southern States, is mainly in March, April, and May. Fortunately, white clover is attractive to honey bees as a source of both pollen and nectar.

Some honey bees gather only pollen from white clover, some only nectar, and many gather both. The nectar gatherers perform an important pollinating service, since they crawl over the pollen-bearing stigmas in order to reach the nectar at the base of the floret. Pollen grains cling to the finely branched hairs that cover the bee's body and are carried from one floret to another, thus effecting cross-pollination.

White clover is also an important pasture plant in parts of most Southern States, and its importance is likely to increase if the present program of pasture improvement expands. Here the seed producers have more flexibility in handling their clover fields than in the Northern States. Because of the mild weather grazing may continue until late in the winter months. Fields that are to be harvested for seed production must have the animals removed about 8 weeks before the usual harvesttime. Clipping the fields immediately after animals are removed controls weeds and favors uniform blossoming. If the seed set and the weather at harvesttime justify it, the field can be harvested for seed. If not, the field can be cut for silage or returned to pasture. In the event that the grower does not own harvesting machinery, he may get a custom operator to mow and combine the crop on a share basis.

This report is concerned only with pollination in the production of white clover seed. Plants should be dense enough so that at harvesttime the field averages at least 500 seed heads per square yard. Harvesting machinery that is suitable for the crop must be used correctly, otherwise much seed will remain in the field. Although most of the information was obtained in Louisiana, it is believed that the recommendations given are generally applicable to all Southern States where white clover seed is produced.

Role of Honey Bees in Setting Clover Seed

Counts were made of the number of bees per square yard visiting the clover blossoms during 5-minute periods. These counts were made in different fields, at different times during the season, and over several years. Most of the bee activity took place between 9 a.m. and 5 p.m. Within one 5-minute period 11 bees per square yard were noted. The usual number under favorable conditions was 2 or 3. A bee sometimes visited up to 18 florets of a single head, but usually from 4 to 8. The seed set of white clover, calculated from samples in the fields, at different locations in Louisiana is given in table 1. In 1958 near Watson additional clover

Table 1.—Seed set of white clover, calculated from field samples, at different locations in Louisiana, 1956-59.

Year	Location	Number of colonies	Acres pollinated	Seed set (lb./acre)
1956	Crowley	20	20	400
	Near Elton	50	280	530
1957	Montegut	40	400	187
1958	Near Watson	30	30	300
1959	Avoyelles Parish			
	Field 1	—	—	210
	Field 2	—	—	336

Spring growth of white clover provides an opportunity to save seed as a sideline crop, if the forage is not needed for grazing.

[1]In cooperation with Louisiana State University.

was growing in nearby pastures. In 1959 in two fields at Avoyelles Parish the number of colonies and the acres pollinated were not counted, but the grower estimated that there were 3 or more acres of clover to 1 colony of bees.

Factors Influencing Bee Activity on White Clover

The activity of bees on white clover blossoms is affected by the weather, colony strength, and competition from other plants within flight range of the colony.

In Louisiana honey bees work best on white clover under the following conditions: temperature between 80° and 90° F., light to no wind, clear to partly cloudy sky, and relative humidity below 60 percent. Usually there is enough favorable weather during clover bloom so that bees can adequately pollinate it. Bumble bees are active under a wider range of weather conditions than honey bees; they visit blossoms even on cool, misty days.

Strong colonies—that is, those with a population of about 50,000 bees by April 1—are best for pollination. Such colonies will require hives that are about four stories high. A strong colony sends a higher percentage of its total force to the field than a weak one. So that the colony can keep a large population, swarming must be prevented by proper management. An experienced beekeeper is needed to maintain colonies at effective pollination strength when clover is in bloom.

Nectar-collecting honey bees may reduce their visits to white clover if other plants are in bloom. The following plants provide easily accessible nectar and bloom concurrently with white clover:

Crimson clover (*Trifolium incarnatum* L.)
Blackberry (*Rubus* sp.)
American holly (*Ilex opaca* Ait.)
Honeylocust (*Gleditsia* sp.)
Wild grape (*Vitis* sp.)
Persian clover (*Trifolium resupinatum* L.)
Rattan vine (*Berchemia scandens* (Hill) K. Koch)
White sweet clover (*Melilotus alba* Desr.)
Vervain (*Verbena* sp.)

There is no practicable way for the seed producer to keep pollinating bees working his clover blossoms if other attractive species are in bloom. However, there are periods during the spring when competition is of no consequence, and a satisfactory seed set may be obtained.

Other white clover growing in the area probably provides the greatest competition for bees placed for pollination of a seed field. The solution of this problem is to increase the number of colonies so there are enough bees to visit all the blossoms within flight range of the apiary.

When white clover was first grown for seed at the Rice Experiment Station at Crowley, there were no other known clover fields nearby. Consequently most of the bees provided for pollination probably worked the blossoms of the seed field. Within 5 years considerable clover was present in both the station pastures and nearby fields. This illustrates how conditions may change within a few years. There was no known source of pollen or nectar within a mile or more of the field near Elton. It is believed that the bees confined their activity to the clover field.

Competition from clover growing near seed fields has been a factor in the lower Mississippi Valley for many years. In the rice-growing area, where white clover seed production is a recent enterprise, there has been practically no competition from nearby fields. However, the recommended rotation of white clover in pastures followed by rice is rapidly increasing the clover acreage. This practice provides heavy competition for the work of the bees introduced for the pollination of particular fields. Clover in adjacent fields is in bloom during the entire spring season unless it is mowed. Even then, blossoms may soon appear.

Nectar Production by White Clover

Nectar production by clover florets is an important factor in attracting insect pollinators. Louisiana common white clover in pastures yielded 4.8 microliters of nectar per blossom in 1952 and 3.2 microliters in 1955 (Oertel 4). Louisiana S-1 strain from field plots produced 8.6 microliters per blossom compared to 8.1, 7.3, and 4.6 microliters from other strains. These results indicate that better nectar-yielding strains of white clover can be selected, which should improve the attractiveness of seed fields to honey bees.

Bailey *et al.* (*1*) found in 1952 there was a general increase in nectar production per blossom as the season progressed, maximum production being reached on June 6. Little is known about the factors that affect nectar production. When several blossoms of about the same age were taken from a plant, it was not unusual to find that at least one contained no nectar.

Seed Production by White Clover

Two methods of obtaining seed-set

Honey bee on white clover.

White clover floret.

values from fields were used—100 dry heads with dry stems, taken at random; and the total heads per square yard. Samples were taken at different times during the growing season over several years.

The samples from fields containing colonies of bees gave an average of 0.25 ounce of seed per 100 heads. Samples from fields where there were no *known* bee colonies yielded 0.18 ounce. In these fields honey bees were seen on blossoms, but there were no colonies known to be near. It was impossible to establish the number of bee trees within flight distance. A yield of 0.25 ounce per 100 heads indicates a potential yield of 387 pounds per acre, whereas 0.18 ounce per 100 heads indicates 267 pounds per acre.

Samples containing the clover in square-yard areas were taken from fields where colonies of bees provided pollination. Such samples contained an average of 500 heads, consisting of blossoms, green and dry heads, and partly shattered old heads. An average of 0.70 ounce of seed was threshed from these samples.

The apparent discrepancy between the weight of seeds obtained by the two methods is probably accounted for by the blossoms which contained no seeds, the green heads which contained partly developed seed, and shattered heads which were only partly harvested.

Methods of Estimating Effective Pollination

Pollen is needed by bees to provide protein for the developing larvae. Large amounts are used in the spring when brood rearing is at its height. In previous studies (Oertel *3*) from 1 to 3 ounces of clover pollen was collected per day in a trap at the entrance of a hive. An unknown additional amount was carried through the trap. A clover floret produced about 3,000 pollen grains, and a clover pollen pellet contained about 388,000 pollen grains. Calculations based on these figures indicate that one pollen-collecting trip by one honey bee might result in the formation of 260 to 3,640 seeds.

The possible seed set per acre has been estimated in a different manner in table 2. It may be considered that the calculated seed set cannot be reached. With improvements in both field and pollination management the evidence indicates that such a set could be approached. The largest seed set per square-yard sample was taken at Crowley in 1956. It contained 744 dry heads that produced 2.17 ounces of seed, a rate of 656 pounds per acre. There are 900,000 to 1,000,000 Louisiana white clover seeds in a pound. The best samples of 100 dry heads gave a yield of 0.51 ounce, which was 75 percent more per head than was obtained from the best square-yard samples. Erith (*2*) reported that a single white clover floret is capable of producing seven seeds. Probably such production is seldom reached in the field. A commercial seed grower should not be satisfied with a seed set of less than 2 per floret (100-140 per head) and should try for at least 4 per floret. Blossoms early in the season had an average of 70 florets whereas those that bloomed late had 50.

Relation Between Seed Set and Seed Harvest

Under ideal conditions a close relationship would be expected between the set in a field and the amount harvested. The grower is mainly concerned with the amount harvested, but a beekeeper who furnishes bees for pollination is mostly concerned with the amount of seed set. The beekeeper believes that if seed is present the bees have done their job, and it is up to the grower to harvest the crop. A grower knows that unfavorable weather may greatly reduce the amount of seed harvested or even prevent harvest entirely. For example, in 1957 tropical storm "Audrey" covered some fields with nearly a foot of water. A part of the seed was harvested from fields that drained rapidly, but in other fields the crop appeared to be beyond recovery. Another example occurred in 1959 in the vicinity of Baton Rouge. From May 20 to June 20, the usual seed-harvest period, rain fell on 22 days; thus harvesting was prevented.

The effect of unfavorable weather upon the amount of seed harvested is indicated in table 3 by the lower yields of the Southern States (*5*). Their yields were roughly 10 to 20 percent of the calculated yields, based on samples of actual seed set. Failure to use harvesting machinery properly accounts for heavy seed losses. In one test rethreshing of material that had gone through the combine showed a recovery of 50 pounds of seed per acre. In other tests from 1 to 6 percent by weight of the material that passed through the combine consisted of clover seed. Equipment used by a successful Louisiana seed grower recovered all but 11 pounds of seed per ton of dry material in a field that showed a calculated set of 210 pounds per acre.

The combine should be carefully adjusted to save all the seed even though considerable foreign material must be cleaned out later. The ground speed should be slow, probably not over 2 miles per hour, unless the swath is rather light. It is particularly important that the swath be well dried. Under some conditions Louisiana growers could employ a chemical defoliant to eliminate excess vegetation or they might find that early cutting of a portion of the seed crop, followed by a second cutting, would be profitable over a period of years. Accurate, long-range weather forecasts would be of great value to seed growers. A light seed-tight rack could be built to collect straw blown through the combine, which could then be rethreshed in a stationary combine or thresher.

Table 3.—Production of white clover seed in six states, 1946-1957.

State	Acres harvested		Yield (pounds per acre)	
	1946-55	1957	1946-55	1957
Idaho	8,140	18,000	228	250
Wisconsin	2,210	600	170	110
Oregon	1,280	2,500	127	150
Mississippi	4,720	1,500	72	50
Alabama	5,929	2,000	68	60
Louisiana	11,400	11,500	52	55

Table 2.—Calculated set of clover seed per acre.

Number of blossoms per square yard	Pounds of seed per acre[1]	
	50 florets per blossom	70 florets per blossom
300	320	448
500	533	747
700	747	1,045
900	960	1,344

[1]Based upon a set of 2 seeds per floret. With 4 seeds per floret the yield is doubled.

Insect Enemies of Clover

White clover has some insect enemies which cause severe damage at times and minor damage more fre-

quently. Dan F. Clower (personal communication)[2] states that the variegated cutworm *(Peridroma saucia* (Hubner)), the armyworm *Pseudaletia unipuncta* (Haw.), the corn earworm (*Heliothis zea* (Boddie)), and the legume mite *Petrobia apicalis* (Banks) sometimes cause enough damage to require an insecticide. Most seed producers do not have equipment to apply insecticides to the clover plants. The value of the potential seed loss may not justify the use of insecticides since the fields can be used for pasture most of the year.

Improvement of Pollination by Honey Bees and Other Insects

No special bee management practices have been devolped to increase clover pollination. It is recommended, however, that only large colonies with young queens be used, since such colonies send large numbers of pollen and nectar gatherers to the field. Fortunately clover blooms in the spring when bee colonies normally are increasing rapidly in population.

It is recommended that colonies of bees for pollination be located by April 1. They may be placed near the edge of fields of 50 acres or less and near the center of larger fields. The seed grower should remember that sometimes bees fly a mile or more in all directions from the hive. One colony per acre is believed sufficient to provide pollination for seed fields where nearby fields contain white clover. One colony to 3 acres is probably adequate where there is little or no competition from other species or nearby clover fields. The seed grower must remember that bees cannot be compelled to work on the blossoms of a particular field. They are known to exercise preferences. Experiments are needed to determine whether increasing the number of colonies per acre of clover will generally result in a profitable increase in seed set.

Pollination Service to Seed Growers

In Louisiana, Mississippi, and Alabama honey bee colonies are not moved frequently. The beekeepers prefer permanent locations if the honey crop is satisfactory. Seed growers can often obtain plenty of bees for pollination by offering free apiary sites in or adjacent to their seed fields. A few pay a rental fee for the use of colonies during clover bloom; others own some colonies. The beekeeper is entitled to a reasonable rental fee or a satisfactory honey crop. A fee of $4-8 per colony is believed to be fair to the grower and the beekeeper. A brief, written rental agreement will avoid misunderstandings.

[2]Entomologist, Louisiana State University Agricultural Experiment Station.

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★ Editorial for March ★

Figures for the Years Ahead

by BYRON ALDRICH

Moneta, Iowa

Let us take a look at the year 1975—just 15 short years from now. I have some figures published by the school reorganization program and the Caterpillar Tractor Co., which should be quite accurate. Our school population will have increased by over 50%. Think of the possibilities and the amount of fine table honey they could consume. Right now there are 1,843,000 more children in our schools than the schools were built to accommodate. There is already a shortage of 135,000 class rooms.

We will need almost double our present supply of water, 123,000 more dams and many miles of levees, double our present hospital facilities, triple our electrical power, double our school facilities, 20 million new homes, 20% of our present housing rebuilt, 2½ times as much oil, 60% more lumber and double today's pulp wood production, 55% more metal ores, soil conservation on 1,159,000,000 acres.

These facts should make us honey producers sit up and take notice. If the acreage were properly seeded to nectar bearing plants, it would enable over a billion colonies of honey bees to produce a crop of honey each year. This year in the United States there were 5,403,000 colonies of bees.

At present we have much land in Soil Conservation and it could be possible to have this land seeded to nectar bearing plants.

It would require considerable legislation. It would require the whole beekeeping industry to be solidly organized from the ground up. Starting with little groups then to entire states, then all states under a national head, "The American Beekeeping Federation."

This National head is a *must*, we cannot get legislation or recognition without it.

We have a good start because we already have this set-up. What we do need is more and stronger local organizations to back the State and National Organization 100%.

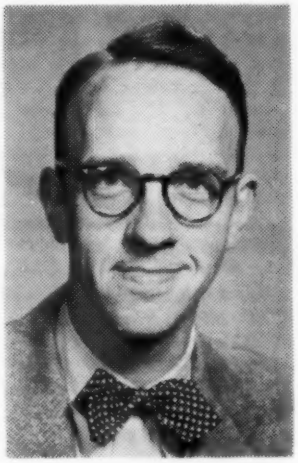
It is the honey producer's job to prepare for his future. After all, if he doesn't do it — WHO WILL?

The Sideline Producer

Editor— AYLMER J. JONES

Outline of a Sideliner System

by DR. RICHARD TAYLOR



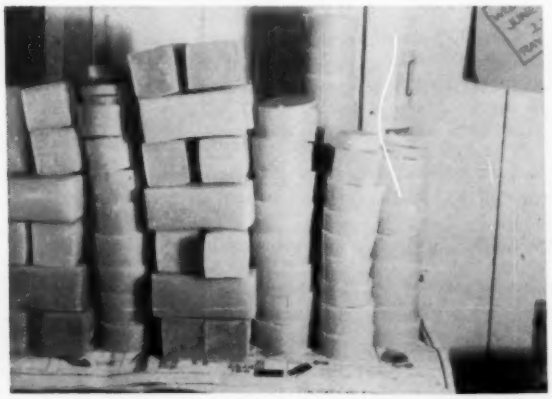
I believe in simplicity of operations, based on careful planning, and uniform, standard equipment. Operations calling for extensive manipulation or special equipment are avoided, to cut costs and labor. The urge to manipulate and experiment is satisfied by having a few colonies in my back yard.

The first and most difficult object is to have strong healthy colonies by late spring that *will not swarm*. After that, it's easy—just pile on supers, harvest and extract the honey, let the bees do the rest.

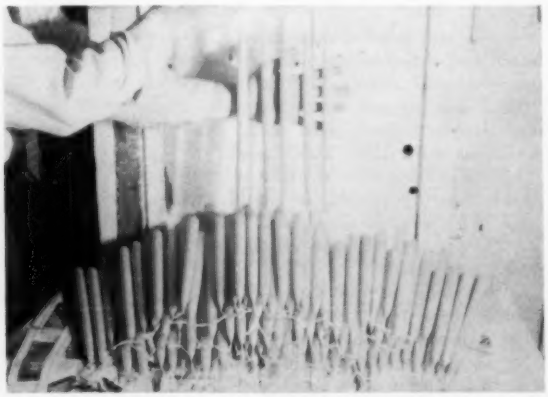
The colonies go into winter one and a half stories high—the brood chamber, with a little honey and pollen, plus a shallow extracting super of dark combs, fairly well filled, which stays there the year round. This gives the bees about thirty-five pounds of stores, sometimes a bit more or less, which is plenty for this region, with its mild winters and early spring. No winter packing is used, but the hives are sheltered by natural wind breaks, and the entrances restricted to keep mice out. Moisture kills bees, not cold, so I leave a crack in the inner cover hole to let it escape.

The latter part of September, when the honey has been taken, I heft each colony from behind, and those that are so light as to make it likely they would starve, or which are otherwise not in proper condition for wintering, are killed with cyanogas. This is heart-rending, but it serves a good and essential purpose, enabling me to cull the combs, paint and repair the hives, which are then in fine condition for making divides and thereby controlling swarming when I expand back to normal size the next spring. This is a basic step in my management. I write on each hive the year the combs were last culled. The colonies to be wintered—about ¾ of the total number—are then each fed a gallon of thick syrup with ½ teaspoon of soluble sulfa, by inverting a gallon mayonnaise jar over the inner cover hole. Outer covers are replaced a few days later, with a brick on top, when the empty jars are removed.

Spring thus finds me with about forty colonies in seven apiaries. These are soon expanded by judicious division to fifty or sixty. New queens ordered in January begin arriving ten at a time in late April. Another gallon of syrup, with ½ teaspoon of sulfa, is given to each colony while requeening is going on. A warm day is picked, and very strong colonies are divided by moving the colony to a new stand while the bees are flying well, putting one of the reconditioned hives with drawn combs on the old stand with two frames of brood and the old queen or, if she is more than a year old, with a new queen. The hive moved to the new stand accepts a new queen without a hitch, since it contains only young bees, the old ones having flown back to the new hive on the old stand. Every colony thus starts out with a young, vigorous queen, overstrong colonies are divided, and swarm fever seldom gets started. Later, if I find a colony building swarm cells, I just divide it, moving it to a new stand and, as before, putting a fresh hive of combs, with two frames of brood and the old queen, on the old stand. No danger of a swarm then. As soon as the feeding and requeening are over, by the end of April, the first super goes on, with sticky combs, and without any excluder.



The year's crop of pure capping wax from fifty colonies, worth 42c per pound on the market.



Some of the same wax a few hours later, now made into candles worth over $2.00 per pound.

Honeyflows are seldom very heavy here, but they are numerous and long, so that the bees usually bring in nectar all summer, right through September. This is why the foregoing procedure, involving divides and minimizing swarming, works so well. Some colonies put in 150 pounds, and a sixty-pound over all average is a modest expectation. The nature of the flow requires queen excluders. I increased my harvest about a third when I began using them. But they must be used right. I put them on about mid-June, after the bees have begun to work well in the supers, and after swarming has ceased to be very tempting. The covers are removed, a good cloud of smoke is puffed over the super frames to induce the queen to go below in case she's not there already, then in go the excluders over the food chamber. A few days later a check is made below for eggs and, if none are found, the queen who didn't go below is run in at the entrance. Since excluders go on beneath supers already in use by the bees, there is a problem of trapped drones above them, but this is easily solved by using an excluder which has a small notch chipped from the front upper side of the frame, for a drone escape. Queens never enter supers through that notch, for they would have to leave the hive to do so. It's a perfect solution. The excluders confine brood rearing to the lower story and a half, and induce the bees to store honey instead of using it up in brood rearing. My goal is to get lots of honey, not just lots of bees. Excluders also make harvesting easy, the supers being nicely filled and free of brood.

With an excluder and at least three supers on each hive by the latter part of June, the bees can be left quite alone until mid-August.

At harvest time, supers are cleared with Porter bee escapes. This means an extra trip to the apiary, but it's easier anyway. Anyone who likes fresh honey doesn't like the stench of carbolic around the apiary, to say nothing of the danger of contamination of honey or of corrosion to the beekeeper's hands. I use special escape boards, similar to inner covers except that they are made mostly of screen. They work very fast and efficiently, the bees above maintaining contact, through the screen, with the bees below. For some reason, this encourages them to leave the supers almost at once, usually to the last bee. I make these escape boards from excluder frames and window screen, and they last for years.

Supers are piled in the honey house with small blocks between them, to allow circulation of air. If the weather is cool, a small kerosene stove is lit the night before, to make a warm room and warm honey by morning. My two four-frame extractors are rigged with old refrigerator motors, and speed is controlled by a cord which adjusts the tension on the belt by raising and lowering the motor slightly. As the honey comes out it goes through a kitchen strainer, to which is affixed, by clothespins, two new, clean nylon stockings, one inside the other—a perfect strainer. The honey settles in tanks for a few days, foam is skimmed off with a pancake turner, and clear honey is drawn at the bottom. The settling tanks were made from clean, rust-free oil drums fitted with honey gates, painted inside and out with aluminum paint, and coated inside with a durable plastic lacquer. The honey soon granulates in sixties in the honey house, is later melted, four cans at a time, in a water bath at 140°, put in cans and jars ready for customers. I have never had any trouble selling it all by the following spring, at 25c per pound net after packing costs, 50c in fancy containers.

The well drained cappings are melted in late fall, and the wax drawn off into milk cartons, to give me clean, uniform blocks. These are used to make hand-dipped candles, which I make one hundred at an operation, and sell at 75c a pair, wholesale, giving me a very nice price for the wax. These are gone in a few weeks; I never had enough for the demand.

Honey raising is a great challenge to a naturalist and gadgeteer. It is a satisfaction to see everything go pretty much as planned, and bring home the station wagon so heavy with supers that it nearly scrapes the pavement. There's always some new gadget to invent, some new wrinkle to test, some new challenge to meet, and something new to learn about the bees.

Nectar Flow and Pollen Yield

"Nectar Flow and Pollen Yield in Southwestern Arkansas, 1945-1951" is the title of a 38-page bulletin available from the Agricultural Experiment Station, University of Arkansas, Fayetteville. The author is Victor C. Thompson who made this study while a member of the Experiment Station at Hope, Arkansas, and who now is associated with the Department of Zoology and Entomology, Iowa State University.

This bulletin contributes important information to our knowledge of the nectar flow and yields of pollen so essential to the maintenance of colonies and the production of honey. There are 55 references.

Randy Taylor, painting plastic squeeze bears in gay reds and blues. Bears hold a pound of honey each, sell for $9.00 per dozen, go like hot cakes at Christmas.

Mead, an ancient alcoholic beverage made from the fermentation of honey. This has aged about two years; tastes like a mellow sherry. Tops of bottles were dipped in beeswax.

Fun For The Family

***Editor*— Pat Diehnelt**

Rt. 1, N83, W13799, Fond du Lac Ave.
Menomonee Falls, Wisconsin

PUZZLES — SCRAMBLES — PRIZE RECIPES

JANUARY SCRAMBLE

Forty four scramble fans unraveled the January Scramble— "The Busy Bee Has No Time for Sorrow," the quotation from William Blake.

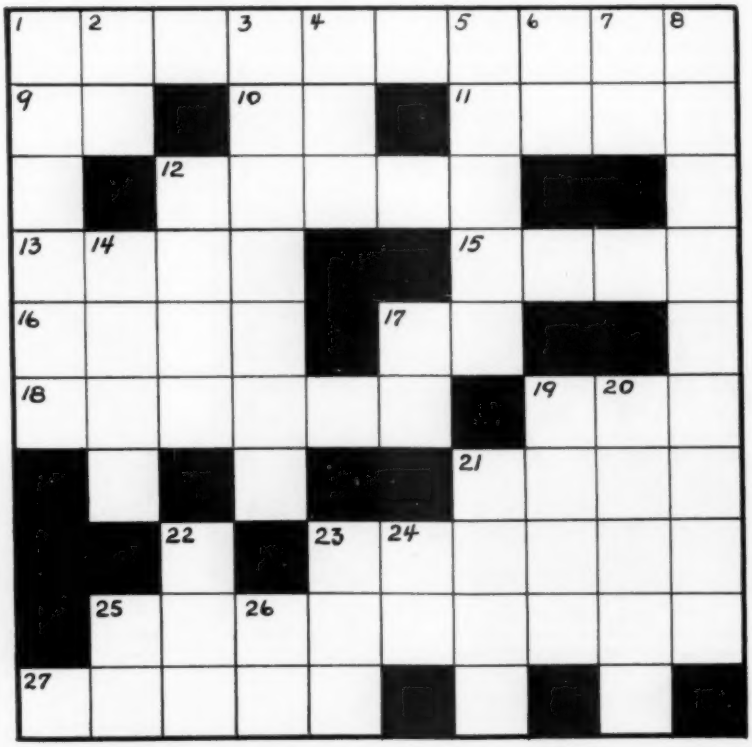
D. S. Jenkins, Rt. 1, Box 155, Kerrville, Texas; E. C. Wolford Sugar Loaf Farm, Warren, Vermont; Edwin Englert, R. 2, Rosemount, Minnesota; Mary Howell, 419 W. Centennial, Bowling Green 3, Mo.; Mrs. Dareed Hanson, La Farge, Wis.; Mrs. Joan Slingerland, Westtown, N. Y.; Mrs. Henry Piechowski, Rt. 1, Box 155, Redgranite, Wis.; Lewter Perry, Cofield, N. C.; Mrs. Charles Wiley, 10500 Mira Loma, Reno, Nevada; Mrs. Hilda Matthis, RR 3, Pleasant Hill, Mo.; Mrs. Ray Ortgiesen, 620 Douglas Ave., Dixon, Illinois; William J. Stapf, 1609 Chislett St., Pittsburgh 6, Pa.; Wm. J. Haug, RD 4, Box 158, Glen Allen, Va.; W. H. Colvin, Edinburg, N. Y.; Mrs. Paul A. Ballard, Box 64, Roxbury, Delaware County, N. Y.; Elmer J. Zoak, RD 2, Catlett, Va.; Duana G. Simon, RD 1, Westfield, Pa.; Mrs. E. B. Purchase, Rt. 2, Box 280, Wapato, Wash.; Edward W. Crowder, J., Box 301, South Hill, Va.; Wilbur W. Acker, 620 Linwood Dr., Troy, Ohio; Mr. and Mrs. E. Paul, Busy Bee Apiaries, Ft. Garry, Manitoba; Mrs. Jacob Funk, E. Lynn, Ill.; Vince Dunlap, 325 Bixby, UCD, Davis, Calif.; Mrs. Clarence Judson, Rt. 1, Box 29A, Yuba, Wis.; Fred Dettmering, 716 Taylor St., Medford, Wis.; Mrs. Victor J. Brown, 601 16th Way, SW, Birmingham 11, Alabama; LeRoy John W. Jackson, 71A Rowe St., China Lake, Calif.; G. D. McKeever, Buckeye, W. Va.; Mrs. Ardith Wyckoff, Maple Ave., Box 36, Chester, N.J.; Warren E. Blackburn, Box 402, Nucla, Colo.; Mrs. Margaret Danabauer, St. Joseph, Minn.; Lowell Carney, Rt. 1, Greene, Ia.; Mrs. William Swart, Rt. 1, Waldo, Wisc.; Mr. William C. Bryant, 1301 S. Ratan, Salem, Ill.; Cynthia Neff. P.O. Box 416, Ansonia, O.; Mrs. Arnold Perlick, Rt. 1, Box 3, Suring, Wis.; R. S. Snare, Rt. 1, Cherokee, Kans.; Galen Rodewald, P.O. Box 813, Madera, Calif.; Mary Amouaux, Bohners Lake, Wis.; Althea Haltinner, Rt. 1, Hilbert, Wisc.; A. S. and Clydie A. Bird, Apple Blossom Apiaries, 10011 140th St., Edmonton, Alberta; Emil Domas, Ritter, Oregon; Mrs. Harry A. Powell, 1242 East St., New Britain, Conn.

FEBRUARY SCRAMBLE

How Doth the Little Busy Bee Improve Each Shining Hour and Gather Honey All the Day from Every Opening Flower — from Isaac Watts. (Winners in next month).

THE MARCH SCRAMBLE

egrepide fo teh yeohn cernocn odse otn ebe het a rolvec yan etmi ot rsiacotcyar si mih



March Crossword Puzzle

Sorry, but I have not yet found time to announce those who got the February puzzle right. Will try to get them in the next issue. Meantime, try your skill at this second puzzle. As before, send your answers to me.

ACROSS

1. Important in wintering
9. Whether
10. 1st satellite of Jupiter
11. Chief
12. Honey Plant
13. Portable shelter of cloth
15. Edible seaweed
16. Girl's name
17. Alas!
18. Damaged essentially
19. Jujube
21. Genealogical diagram
23. Nest building bee
25. Distant bee yard
27. Meaningless

DOWN

1. Cold season
2. In case that
3. Outapiary is 2 to 3 miles .....
4. Botany (abbr.)
5. Occurring near the beginning
6. Argon (Symbol)
7. Kilocycle (abbr.)
8. Important in bee yard
12. Against
14. Fancy case for toilet articles
17. Advertisement (colloq.)
19. Earth Goddess
20. Wary (slang)
21. Make neat
22. Bowl-shaped vessel
23. Key or islet
24. Associated Press (abbr.)
25. Old Measurement (abbr.)
26. Telegraphic transfer (abbr.)

Here We Go, Ladies

The recipe winners for January, February and March are given here. Each of them will receive Honey of a Cook Certificate. We gave up the idea of photographing the recipes. Just can't make a go of it. Winners will receive instead a large cook book of honey recipes. The runners up will get a recipe folder. Those who have not tried yet, send me your best honey recipe, just one on a single sheet of paper. Write your name and address on every page. Crossword puzzle answers and scramble answers, please send on separate pages.

Pat

RECIPE WINNERS

For January

VIRGINIA PECAN PIE

3 eggs, 1 cup sugar, ¼ cup butter, ½ cup honey
1 cup pecans, 1 teaspoon vanilla

Combine sugar, honey and melted butter, add vanilla, eggs and pecans to syrup mixture, mix thoroughly. Pour into 9 inch pie shell. Bake 40 to 45 minutes in 375 degree oven. Cool.

Mrs. Mary P. Crowder
South Hill, Virginia

February Winner

CHERRY HAM

Remove 3 - 4 lb. ham from can. Place, fat side up, on rack in shallow pan. Combine ½ cup brown sugar and ½ cup honey; spoon over ham. Bake in slow oven (325°F.) 15 minutes per lb., basting occasionally. Note - Canned hams range from 1½ to 15 pounds plus.

SPICY CHERRY SAUCE

1½ tablespoon cornstarch
½ cup sugar
¼ teaspoon allspice

1 can (1 lb. 4 oz.) red sour pitted cherries. Combine dry ingredients in small saucepan. Gradually stir in juice drained from cherries. Cook until thickened and clear, stirring constantly. Add cherries, spoon over ham.

Submitted: Don Hollarn, 223 Polk St., Grank Forks, N.D.
Recipe by: Alma Okler, N.D. State Mill & Elevator, Grand Forks, N.D.

March Winner

QUICK ORANGE ROLLS

1 tablespoon orange juice
2 teaspoons rind if desired
½ cup honey
3 tablespoons margarine
2 c. sifted flour
1 teaspoon salt
3 teaspoons baking powder
4 teaspoons shortening
1 cup milk

Make a thin syrup with orange juice, rind and honey, and margarine. Boil 3 minutes.

Sift flour, salt, baking powder together. Cut in shortening. Stir in milk to make a soft dough.

Pour equal amounts of the hot syrup into 12 greased medium tins. Drop equal amounts of dough on top of the syrup. Bake at 400° for about 15 minutes. When baked turn tins upside down to allow honey syrup to run down the rolls.

Mrs. E. C. Wolford, Warren, Vermont

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Are you sure you have ample supers ready for that extra flow?

LET US QUOTE YOU ON YOUR NEEDS.

●

Write For Our 1961 Catalogue

Leahy Manufacturing Co.

Higginsville, Mo.

Your Questions Answered

EDITOR— **W. W. Clarke, Jr.**
204 Ag. Ed. Building
Penn. State University
University Park, Pa.

• *Question from*
Rolland Burdick
Ardmore, Oklahoma

What should be the net weight of the honey in a quart fruit jar? There is considerable honey packed and sold in quart fruit jars. We sell most of ours that way. I thought that if a gallon weighs 12 pounds then a quart will weigh 3 pounds. Some say that there are not 3 pounds. We fill our jars pretty full but allow a little for expansion so the honey will not come out and make a mess.

Answer

It is difficult to get three pounds of honey into a quart fruit jar. The samples that I tried weighed about two pounds twelve ounces when the jar was filled to the point where the lid stopped. Three pounds filled the jar to overflowing. This would vary slightly with the moisture content of the honey.

• *Question from*
Valentine Konefal
Grand Island, New York

My problem colony was made up last fall of nucs with some brood from a strong colony the latter part of September. At the end of September there was evidence of queenlessness. I made an attempt to correct the situation and introduced a marked queen from the South. On Nov. 8th the supers had honey and also brood but the worker cells were bullet like. Still I was satisfied with the condition of the colony and prepared it for winter. I covered it with corrugated paper and with one thickness of tar paper. There were leaves on the top.

This spring I found the colony to be very weak but the same queen was still there, walking about with an egg protruding from her abdomen. There were plenty of empty cells but very little brood, some of it protruding at the top as in a queenless colony. Three of the combs in the upper super were full of honey but it was wet with water; some mouldy comb; some dead bees stuck to the surface. There was considerable shredded wax; dead bees outside of the hive. What could I have done to save this colony? Should I have placed it over a strong colony above paper and excluder or should I have added a package of bees to it?

Answer

It would sound to me as though your colony was not in good condition last fall; also, that you did not provide for an upper entrance or some type of ventilation to take care of excess moisture. I notice you packed the bees, which I suppose you find necessary on Grand Island.

There are several ways to strengthen a hive, such as exchanging locations with a strong colony, adding package bees, or uniting with another colony. I would prefer uniting, since I can see little value in trying to save a weak colony. Exchanging locations with a strong colony works rather well. If you should be fortunate to catch a swarm, you might add this to the colony. If I were uniting it with a strong colony, I would use a double screen or a newspaper between, and place the best colony on top.

• *Question from*
Donald B. Linkous
Monroe, Ohio

There are three subjects about which I wish your help: first, spring feeding with an antibiotic as a general safety measure; second, I wish to start fifteen colonies this coming year. My experience is that I get little honey the first year. Would it be advisable, just before the clover flow, to set a two pound package over the inner cover? If these bees are accepted, the strengthened colony might then collect some surplus; third, can old combs be reduced to usable wax with a solar wax extractor?

Answer

Antibiotics, fed in the spring, have been very effective in controlling disease in our area. It is important that you find out what the regulations are in your state before using them.

I think a three pound package of bees introduced in early April and fed generously should produce honey the first year. Most beekeepers do not feed enough. A two pound package introduced just before the honeyflow should certainly be a shot in the arm to the colony.

A solar wax extractor will remove a fair amount of wax from old comb, but send the slumgum or refuse away to one of the bee supply houses for rendering. Steam and pressure are needed to do a thorough job.

Plans for a solar wax extractor are enclosed.

• *Question from*
George A. Collins
Newton, Illinois

Would "Bee Kill" be safe to use in a dwelling house? The bees usually swarm when they try to change the queen. Is this normal? I took all the bees and returned them.

Answer

I cannot remember hearing of "Bee Kill." If you can give me the formula, I could tell you more about how safe it is to use.

All insecticides and poisons must be used with care around the home. Follow directions on the label.

Bees often swarm when they try to exchange or supersede queens. These swarms are known as supersedure swarms.

• *Question from*
Mrs. J. A. Swedberg
Caledonia, Minnesota

Would it be all right to place my bees on the south side of my garage for winter? They would have to be set right against the white building so therefore would be warmed considerably on a sunny day. Would this variation in temperature decrease or increase their chances of wintering successfully? Would they require more food?

Answer

I think you could probably winter your bees successfully on the south side of your white garage. It is important that the bees get warm at intervals to move their cluster and even get a flight. It is possible they would consume more food, but then again they may rear more brood in the early spring which should make a better colony.

MEETINGS

Bristol County (Mass.)
March 15th, Segregansett

The Bristol County Association extends an invitation to interested beekeepers in all the surrounding counties in Massachusetts who would like to hear a discourse given by one of our Massachusetts Federation of Beekeepers' Association delegates, Mr. Justin H. Caswell. His discourse will be on POLLINATION. As Mr. Caswell is an expert on this feature of beekeeping, having had years of experience both in his own State of Massachusetts as well as in the State of Maine, you will, no doubt, want to hear how he does it; and, what has made him so successful at it.

Planned pollination of legume flowers as well as berry plants is as essential to the production of a good seed crop as land preparation and favorable weather. Planned pollination means arranging to have enough insects at hand to get a maximum set of seed when the crop will be in bloom. It pays both ways. The farmer gets a large seed production and the beekeeper gets the honey and the money, as well.

Please, try to be in your seats at about 7:45 P.M. on Wednesday night, March 15, at the Bristol County Agricultural High School in Segregansett, as our free beekeeping school gets started promptly. As an added feature there will be two Movie Films in Sound and Color on BEES FOR HIRE and THE POLLINATION OF ALFALFA.

We will have Honey Cakes for you all as well as Hot Coffee served at the Refreshment Hour by Mrs. Vivian Caswell.

Mary V. Maslanka, Corres.-Sec.

Middlesex County (Mass.)
March 25th, Waltham Field Station

March is a busy month for Middlesex beekeepers. At the Spring Flower Show sponsored by the Mass. Horticultural Society at Wonderland in Revere, the club will have an educational exhibit with several observation hives and members present to answer questions. The Flower Show will be held March 11-19, 10 a.m. to 10 p.m.

Our monthly meeting will be March 25 at 6:30 p.m. with a pot luck supper followed by a meeting which will include a talk on Bee Diseases by Henry Neunzer and a question and answer period for beginners.

B. Carlson, Corres. Sec.

Northeastern Kansas
March 5th, Kansas City, Kansas

This association welcomes ALL of its members and any person interested in Bee Culture to attend the meeting to be held Sunday, March 5th, 2:30 P.M. in the I. O. O. F. Hall 2107 Silver Ave. (Argentine District) Kansas City, Kansas.

Mr. Carl Kalthoff, commercial beekeeper of Lexington, Missouri, will speak on the subject of Spring Management. Questions will be in order after the speaker has finished. A motion picture "The Realm Of The Honey Bee," will be a feature of the day also.

Come!—Join! and help us achieve "OUR GOAL" and we shall be more than happy to help you reach yours.

This Association meets the first Sunday of each month. If you have not received your magazine by the last day of the month and wish to attend, contact Association Editor R. F. Ferguson, 4126 Francis St., Kansas City 3, Kansas, Phone—YEllowstone 2-2710.

R. F. Ferguson
Association Editor

Worcester County (Mass.)
March 18th, Worcester

The March meeting of the Worcester County Association will be held at the Worcester County Extension Service, 36 Harvard Street, Worcester, on March 18.

At 6:30 P.M. a pot luck supper will be served followed by the business meeting. Mr. and Mrs. David Henderson will show slides of their trip to Bermuda.

Annual Course in Beekeeping—

Sponsored by the Worcester County Beekeepers Association and the Worcester Natural History Museums.

Held at Rice House Annex, Childrens Museum, 41 Elm Street, Worcester, Massachusetts.

Each class is held on Thursday evening at 8:00 P.M.

March 2nd—

B. W. Richardson, Worcester, General introduction to beekeeping, elementary terms, and equipment necessary.

March 9th—

Philip Pike, Worcester, Honey plants in sequence, spring to fall, slides.

March 16th—

Wallace Parker, West Boylston, Slides, showing different colony combinations. Caucasian versus Italian bees.

March 23rd—

Aylmer J. Jones, Malden, Honey producing and processing.

March 30th—

Mr. Fred Blaine, Indian Orchard, Inspector. Spring management, colonies for pollination.

April 6th—

Asa Olsen, Concord, Single brood nest and wintering, same.

April 13th—

Mr. Robert Havener, Westminster, One and one-half colonies.

This course is free to all who are interested.

Glenn T. McLain, Jr.

Midwestern Association
March 12th, Kansas City, Mo.

The Midwestern Association will hold its regular monthly meeting at the I.O.O.F. Hall, 812 Westport Road, Kansas City Missouri, 2:30 P.M. Sunday, March 12, 1961.

There will be a speaker and discussion on Honey Plants, and Spring Preparation in the Bee Yard.

Refreshments will be served. Everyone welcome.

James A. Worrel
Secretary

Crawford County, Kansas
March 18th, Cherokee

The Crawford County beekeepers will meet March 18th, 2 p.m. at the Snare honey house, Cherokee, Kansas. The honey house is located on the north side of Highway U.S. 160, one mile east of Highway K 7. We are expecting Mr. Magers of Kansas City to Show colored slides of honey plants. Refreshments will be served.

We would like to invite anyone who is interested to attend.

Mrs. R. S. Snare, Sec.-Treas.

Jackson County (Mich.)
Jackson, March 9

A meeting for the Jackson County beekeepers will be held March 9, at 7:30 p.m. in the Jackson County Agricultural Room in Annex B-1. The topic will be "Beekeepers' Mistakes and Stingless Beekeeping."
Mrs. Carl Van Arsdalen, Sec.

New Hampshire Association
March 11, Westmoreland

The second of two special meetings for beginners will be on March 11th at the Town Hall in Westmoreland. Mr. Paine will be in charge of the program. The subject will be, "Packages and Proper Equipment."
Barbara Prior, Sec.

Report of the Auxiliary
American Beekeeping Federation

The Women's Auxiliary of the American Beekeeping Federation met in the Pax Room of the Paxton Hotel in Omaha, Nebraska on February 3, for their annual meeting. The meeting was a brunch with a program and business meeting.

The president, Mrs. Harold Partello of Boone, Iowa presided. More than seventy members and guests attended.

Mrs. Carl Soder, chairman of the Honey Queen Committee presented the 1960 Honey Queen, Miss Monnica McNutt of Tennessee who in turn presented the contestants for the 1961 Honey Queen. The contestants were each presented with an Auxiliary pin from the Auxiliary and a bracelet from the Iowa Auxiliary. The program consisted of talks by Mrs. Harriett Grace of the American Honey Institute; Mrs. Mona Schaefer of the California Advisory Board and C. D. Floyd of Excelsior, Minn. Mr. Steve Polchert, art instructor of Boys Town, showed pictures and gave a demonstration on making ceramics.

There were tours of Jocelyn Memorial and Boys Town.

At the business meeting the following officers were reelected: president, Mrs. Harold Partello, Boone, Iowa; vice-president, Mrs. Lawrence Budge, Malad, Idaho and secretary-treasurer, Mrs. Clayton Adee, Kearney, Nebraska.
Marie Adee

Ullrich Easter Mosaic

For a number of years A. C. Ullrich, member of the Illinois State Association, has prepared a mosaic like this. He is a commercial artist at Route 3, Box 488, McHenry, Ill. This is his story about this mosaic:

The Easter Season celebrates the Resurrection of Jesus. Its special interest to beekeepers is in the fact that a portion of His first food after he appeared was honey. His first words were: "Have ye here any meat?" And they gave of what they had, a piece of broiled fish and honey comb, likely provided by a fisher friend and a beekeeper. So it seems that "Honey for Easter" has a special significance and a rightful place in the hearts of beekeepers.

Reprints in full color of the original mosaic may be obtained at $1.00 per print; 35 mm color slides $1.00. Sepia enlargements may also be obtained. Quotation on request.

Federation News

Secretary Joseph O. Moffett
P. O. Box 855, Fort Collins, Colorado

The 1961 Omaha convention is now history. Highlights of the convention were the publicity program, the queen contest, and the banquet.

Prather is 1961 National Honey Queen. Elaine Prather of Tennessee was chosen as the 1961 honey queen replacing Monicca McNutt, also of Tennessee. The contest was the best yet, with Pennsylvania, Iowa, Nebraska, Michigan, and Wisconsin also entering queens in the contest.

Spence publicizes convention. Henry Spence spearheaded an aggressive effort to obtain publicity for the bee industry before and during the convention. Certainly the radio, TV, and newspaper coverage was the best we have ever had. Preconvention publicity was sent to 150 large newspapers throughout the nation.

Spence arrived at Omaha a week before the convention started to arrange local publicity. During the convention the local paper printed at least one article each day.

Spence also took pictures of individual beekeepers to send to papers in their own locality. An even larger publicity program is planned for the 1962 convention at Biloxi, Mississippi.

Minimum Federation dues raised to $5.00. Federation dues were changed by a vote of the membership at the convention. Effective immediately, minimum dues are $5.00. Suggested dues are 4c a colony. The rest of the dues schedule will be in the Federation Newsletter.

San Antonio will host the 1963 convention. The executive committee voted to hold the 1963 convention at the Gunter Hotel in San Antonio, Texas. The dates for the 1962 Biloxi convention were announced. They are January 22-27.

Hansen, Walker, Moffett are 1961 officers. Henry W. Hansen of Dakota City, Iowa was elected president of the Federation. G. C. Walker, Jr. of Pharr, Texas is the new vice-president. Joseph O. Moffett of Fort Collins, Colorado was reappointed as secretary-treasurer.

New members of the executive committee are Garnett Puett, Hahira, Georgia, and Millard Coggshall, Minneola, Florida.

384 register at Omaha. There were 384 registered at the convention. 291 attended the banquet. It was one of the best conventions ever held, from the arrangements standpoint, as everything went off very smoothly, no doubt due to the hard work and ability of Charlie Moosman and Henry Hansen and their coworkers.

Federation needs the support of every beekeeper. The growing Federation urgently needs the support of each beekeeper. Federation membership increased by 172 in 1960 for a total membership of 1194 compared to 1022 in 1959. Let's do even better in 1961. Several new programs have been started to make the Federation of even greater benefit to the bee industry. We need the help of each beekeeper to carry them out successfully. Join with your fellow beekeepers in the growing Federation.

Obituaries

FRANK ZUPANIC

News has reached us from Ralph Klebes, Secretary of the Will, Grundy, Kendall (Ill.) Association and from Mrs. Stella Zupanic that Frank passed on January 19th. According to his wife he went to lie down and when she called him he had died.

Mr. Zupanic was born in Jugoslavia and was a well-known beekeeper for the past 35 years, operating 600 colonies in the vicinity of Joliet. A devoted member of the Will, Grundy, Kendall Beekeepers' Association also a regular member of the Illinois State Beekeepers' Association. With the help of his wife they produced a very fine crop of the best honey. He is survived by his wife Stella, two sons and two daughters. The family will carry on the work as Frank would wish.

JEFF ROCKE

E. H. Rocke, Rocke Apiaries, Eureka, has informed us about the loss of his father, Jeff Rocke, at the age of 87. He had a stroke three years ago and his doctor thought he would not recover but he did and worked most of the time until 8 weeks ago when he had a slight second stroke. He passed on with "his clothes on," an active man until the very last. He was born in Eureka in 1873, farmed, raised his family, and then worked with three of his boys who established the Rocke Apiaries, well known to Illinois beekeepers.

American Rabbit Journal
Shows the Way to Success
The leading Rabbit Farming Magazine. Explains the growing meat rabbit industry. Non-fancy. Est. 1931. 3 years $2.00; 1 year $1.00. Sample dime.
American Rabbit Journal
Dept. S. Warrenton, Missouri

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	Queens by Air Mail	2-lb. Bees w/Q.	3-lb. Bees w/Q.
1 to 24	$1.40	$4.50	$5.65
25 to 100	1.20	4.25	5.40

Packages by Express or Parcel Post — For Parcel Post Shipment Add $1.10 For 2-Lb. Pkg. And $1.20 For 3-Lb. Package. Difference, If Any, Will Be Refunded.
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THOUSANDS OF EXTRA QUEENS available for your divisions and requeening. Queens will be available by mid March.

PRICES

Quantity	Queens	2 lb. Pkg. w/Q.	3 lb. Pkg. w/Q.	4 lb. Pkg. w/Q.
1 - 9	$1.30	$4.75	$5.95	$7.15
10 - 49	1.25	4.50	5.70	6.90
50 - up	1.20	4.25	5.45	6.65

Clip and mark queens 5c each operation.

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BEES
QUEENS

3-banded Italian bees and queens direct from our own Bee farm. Shipments start April 1st — express or parcel post shipment. Thousands of extra queens.

	Queens	2 lb. w/q	3 lb.w/q
1 - 24	$1.25	$4.25	$5.25
24 - 99	1.20	4.00	5.00
100 and up	1.15	3.75	4.75

WALTER T. KELLEY CO. **Clarkson, Ky.**

QUEENS — PACKAGE BEES — QUEENS

Two good strains of bees. We are in a better position to give good service than ever. We have queens any time, and package bees after Feb. 25th. We guarantee them to be as good as the best.

STARLINE BEES AND QUEENS

	1 - 25	25 - 100	100 up
2 lb. and queen	$5.00	$4.75	$4.50
3 lb. and queen	6.25	6.00	5.75
4 lb. and queen	7.50	7.25	7.00
5 lb. and queen	8.60	8.35	8.10

STARLINE QUEENS

1 to 25	$1.75
25 to 100	1.65
100 up	1.55

For regular stock bees and queens deduct 30c per queen or package from the prices above. For large order of packages write for prices.
Queens clipped and marked 10c each. Royal Jelly $10.00 per oz.

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Better Bred Queens

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We are the beekeepers' friend, both large and small. We can handle truck loads, also have good express and mailing facilities. We are holding our prices at a minimum, not cutting the quality. Our Better Bred Stock is known throughout the U.S.A. and Canada. They will give satisfaction. Our queen yard is Fumidil-B treated. Book early at the following prices:

	QUEENS	2 lb. w/q	3 lb. w/q
1 - 24	$1.25	$4.25	$5.40
100 up	1.15	4.00	5.45

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USE THIS SENSATIONAL PERMANENT COMB FOUNDATION WITH THE ALUMINUM BASE
See Your Local Bee Supply Dealer

ITALIANS

Package Bees — Queens

Never before have good packages and queens been so important. Serving those who demand the best.

— PRICES —	1 - 9	10 - 49
2 lb. pkg. with young laying queen	$4.75	$4.50
3 lb. pkg. with young laying queen	5.75	5.50
4 lb. pkg. with young laying queen	6.75	6.50
Extra Queens	1.50	1.40

Shipments by express, parcel post or your truck
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ITALIAN QUEENS
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ITALIANS
Queens for 1961
Air Mail - Priced $1.30 each

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A. I. ROOT CO., Medina, Ohio

QUEENS—
Carniolan and Caucasian

Looking forward to 1961 season — am offering same high producing queens bred for early buildup, gentleness, high production qualities of several years breeding. **QUEENS $1.45 each. Air Mail; quantity discount.** Prepared to operate 1500 nuclei to meet the increased demand.

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The Finest Thing Offered Beekeepers

What beautiful even combs to unwrap and labor saved are continued reports of perfectly spaced combs.

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YELLOW ITALIAN
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Good honey producing stock, so gentle to work with. Resistant to E. F. B. We are reliable shippers. Our prices are the same as 1960—

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Your order will be appreciated. We guarantee Health Certificate and live arrival.

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2 lbs. with queen $3.65
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4 lbs. with queen 5.50
Queens Air Mail 1.25

Certificate of health and live delivery guaranteed
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THRIFTY BEES

Combless packages and queens. Three-banded Italians only. Remember THRIFTY bees are guaranteed to please.
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W. J. FOREHAND & SONS
Fort Deposit Alabama
Breeders since 1892

Johnson Dovetailing Equipment
for the beekeeper's shop.
Write for details.
Carl E. Johnson Company
1557 Gregory Avenue
Lincoln Park, Michigan

CONNEAUT

THE SIXTY for the Sixties

BEST ON THE MARKET
Ask
Your Jobber
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THE CONNEAUT CAN CO.
CONNEAUT OHIO

Gaspard's
Quality Italian
BEES AND QUEENS

2 lb. pkg. w/q $3.60
3 lb. pkg. w/q 4.25
4 lb. pkg. w/q 5.00
5 lb. pkg. w/q 6.20

For queenless pkgs. deduct $1.00
Extra queens— 1-9 $1.10, 10 up—$1.00
Health Certificate, Live Delivery and Satisfaction Guaranteed.
10% books your order; balance 10 days before shipping date. Shipping season starts April 1st.

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SPEARS APIARIES
SIMMESPORT LOUISIANA

Italian workers that are quiet, pleasing to the eye, and industrious.
2 lb. pkgs. w/q. $3.50
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Live delivery guaranteed - Satisfaction assured

JENSEN'S QUEENS AND PACKAGE BEES

	Packages with Dadant "Starline" Hybrid Queens			Packages with Jensen's Magnolia State Italian Queens		
	1 to 24	25 to 99	100 up	1 to 24	25 to 99	100 up
2 Lb.	$5.05	$4.80	$4.55	$4.74	$4.50	$4.25
3 Lb.	6.15	5.90	5.65	5.85	5.60	5.35
	STARLINE — QUEENS — MAGNOLIA					
	$1.75	$1.65	$1.55	$1.45	$1.35	$1.25

Clipped FREE Marked 10c Air Mail Postage Paid on Queens.
Packages F.O.B. Shipping Point

JENSEN'S APIARIES Macon, Miss. Phone 170 J

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Packages with Caucasian Queens	1-24	25-99	100 up
2 lb.	$4.75	$4.50	$4.25
3 lb.	5.85	5.60	5.35
Extra Caucasian Queens	1.45	1.35	1.25

Packages with Dadant's Midnite Hybrid Queens	1-24	25-99	100 up
2 lb.	$5.00	$4.75	$4.50
3 lb.	6.10	5.85	5.60
Extra Midnite Hybrid Queens	1.70	1.60	1.50

Queens clipped and marked at 10 cents each additional

HOWARD WEAVER & SONS Navasota, Texas
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BEES ● QUEENS

THREE-BANDED ITALIANS

	1 - 24	25 - 99	100 - up
2 lb. pkg. with queen	$4.50	$4.25	$4.00
3 lb. pkg. with queen	5.70	5.45	5.20
Queens postpaid	1.45	1.35	1.25

Tested queens—$2.50

For larger packages add $1.20 per lb.

No charge to clip or Airmail queens. All 10c each to mark.

Packages F.O.B. here.

W. E. PLANT

HATTIESBURG MISSISSIPPI

AFTER FORTY-NINE YEARS

We are ready to back up our 100% satisfaction on Bees and Queens.

PACKAGES WITH QUEENS (Italian Only)

2-Lb. Pkg. ..... $3.75 any number
3-Lb. Pkg. ..... 4.75 any number
Untested queens ..... 1.10 any number
Tested queens ..... 1.50 any number
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Terms $1.00 per package with orders; balance before shipments.

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BEES AND QUEENS

CARNIOLAN OR CAUCASIAN bees and queens. 2 lb. pkg. $4.00, 3 lb. pkg. $5.00. Queens $1.00. Roy Waddell, Rt. 3, Woodruff, South Carolina.

CARNIOLAN BEES and queens. 2 lb. package $4.00, 3 lb. package $5.00, Queens $1.00. TILLERY BROTHERS, Route 3, Greenville, Ala.

ITALIANS: Packages, Queens. Martz, Rt. A2, Box 846, Vacaville, California.

PACKAGE BEES: 2 lb. package @ $4.75; 3 lb. package @ $5.75. Price delivered in Pardeeville. Will allow .25 per cage exchange. We will also haul bees anywhere for a moderate price for anyone. Ramsey's Jewelry Store, Pardeeville, Wisconsin, Phone 107.

ITALIAN QUEENS, $1.50; Starline $2.00. Write for quantity prices. April 1st-June 1st. No packages. S. J. Head, Crossett, Arkansas.

QUALITY ITALIAN Queen bees—Until June 1st, each $1.35, 5 or more $1.30 each, 25 or more $1.25 each. Reduced prices after June 1st. Write for package bee prices. A. G. Woodman Co., Grand Rapids, Michigan or Lena, South Carolina.

BOOSTER BEES .75 cents pound in your cages after May fifteenth. Can supply new cages and queens. A. V. Dowling, North St., Valdosta, Georgia.

3 LB. ITALIAN PACKAGE bees with untested queen $4.25; 4 lb. bees with untested queen $5.25. Guaranteed live arrival. Deduct 80c for queenless package bees. Golden Apiary, Maurice Roy, Hessmer, La.

ITALIANS: 3 lb. package with queen $5.00; Queens $1.50. Sheppard Apiaries, Aberdeen, North Carolina.

ITALIAN AND CARNIOLAN bees 3 lb. $5.00; 5 lb. $7.00. Extra queens $1.30. Luther Pickett, Efland, North Carolina.

DARK ITALIANS: bred for honey production 3 pound packages with queen $4.75, extra queens $1.20. Henry Loehr, Caldwell, Texas.

CAUCASIAN QUEENS: 1-24 air mail $1.45 each, 25-99 air mail $1.35 each, 100 up air mail $1.25 each. Leo Kretzschmar, 701 E. State St., Eagle Lake, Texas.

ITALIAN QUEENS $1.40 each, 51 up $1.25. Neuse Apiaries, Kingsbury, Texas.

QUEENS March 15, Italians, $1.25. Nassau Bee Company, 510 So. Orland Ave., Winter Park, Fla.

FOR SALE

FOR SALE: Domestic Pollen, Royal Jelly. Also Pollen Supplement Dry Mix (You add water and honey). Royal Jelly Enterprises, 1017 Los Carneros Avenue, Napa, California.

FREE CATALOG: Cypress Bee Hives and bee supplies. Save up to 40% on hives that last. Myers Craft Manufacturing Co., Burgaw, North Carolina.

SUPER STRENGTH 100 mg. Royal Jelly capsules in bottles of 100 for $10.00. Prairie View Honey Co. 12303 Twelfth St., Detroit 6, Michigan.

ROYAL JELLY $8.00 ounce, eight ounces $50.00, full pound $90.00. Delivered Air Mail. Phillips Honey Co., P. O. Box 1506, Clearwater, Florida.

SUGAR Best Quality cane, double saving to beekeepers. McClain, 12491 Lacey, Hanford, California.

Bees—150-2 story 8 frame hives with locations, 500-2 story 10 frame hives, 200 nuclei after May 1st. One Bogenschutz uncapping machine with electric heating units. One electric wax melter. 300 queen excluders. No disease. Paul Engelhardt, Antwerp, New York.

Copy for the department must reach us not later than the tenth of each month preceding date of issue. If intended for classified department it should be so stated when advertisement is sent.

Rate of Classified advertising — 16 cents for each word, letter, figure or initial, including the name and address. Minimum ad, ten words.

As a measure of precaution to our readers we require reference of all new advertisers. To save time, please send the name of your bank and other references with your copy.

Advertisers offering used equipment or bees on comb must guarantee them free from disease or certificate of inspection from authorized inspector. The conditions should be stated to insure that buyer is fully informed.

STAINLESS STEEL surface cooler, excellent condition complete. Will cool your honey from filter to 70°F., perfect for cream honey large capacity, three thousand dollar unit, new. Write Stoller Honey Farms, Inc., Latty, Ohio.

GOOD COMMERCIAL outfit for sale, entirely equipped for honey production in good location. Retirement necessary. Supers and hives with drawn combs; many hives with pollen and honey in nice condition for new packages. Will sell in part, or complete or by payments. Wonderful chance. Write for particulars. Russell D. Smalley, Beaver, Iowa.

FOR SALE: Twelve two-story hives, bees, and equipment. Howard Showers, Mystic, Iowa.

NEW AND used Dadant bee supplies also full colonies of bees, in 8 and 10, single or double brood nest hives, also some in Modified Dadant hives with one shallow brood chamber on top. All are well painted and in excellent condition and inspection certificate furnished. Robert Haskett, Sr., Westfield, Indiana.

SEVERAL LOADS of single story 10 frame colonies. You divide in Central California. Get one colony queenright plus one beeless to divide into for $6.50 each. Art Harrison, P.O. Box 602, Los Banos, California. Phone 2151

65-60 lb. cans honey, 100 colonies bees. Grace Keister, R-1, Box 101, Monroe, Wisconsin.

FOR SALE: 1200 colony registered bee outfit in one of Montana's most scenic mountain valleys. Extra white to water white honey. Warehouse, 2 trucks, equipment complete to run operation, $45,000.00, 30% down, balance 7 years. Please do not inquire unless financially able to handle deal. Best hunting and fishing country. Walter Sagunsky, Sheridan, Montana.

Our book HOW TO KEEP BEES AND SELL HONEY 75c postpaid contains over 100 pages and 175 pictures explains everything from starting to selling the crop. SUPER MARKET BARGAIN. Walter T. Kelley Co., Clarkson, Kentucky.

BEES 400 colonies, 800 hives and supers with combs, excluders, all standard 10 frame, large extractors, tanks, pumps, sumps, feeders, priced to sell. Come see now. 12491 Lacey, Hanford, California.

200,000 pounds damaged cane and beet sugar 5c per pound. Honey Boy, 2824 So. Belt, St. Joseph, Missouri.

FOR SALE: Used power uncapping machine, 2-steam uncapping knives and boiler. M. Kinsman, R. No. 4, Kankakee, Illinois.

100 colonies and some equipment. No disease. Mrs. Robert Patterson, R. 3, Monroe, Wis.

QUEEN EXCLUDERS, entrance feeders, other miscellaneous equipment cheap. Gene Scharzerbach, Mobridge, South Dakota.

700—8 frame all wire excluders, wood rim at less than cost. Hubbard Apiaries, Onsted, Michigan.

1,000 package bee cages, 30c F.O.B. Wade Taylor, Route 3, Lewistown, Montana.

AUCTION SALE: March 18, 1961. 110 colonies 2½ stories, complete honey house—movable, 380-9½ deep hive bodies, 200 shallow supers, 375 comb supers, 185 bottom boards, 175 metal and wood covers. Write for sale bill. Marshall Whitcomb, Rockford, Minn.

150 colonies of bees for sale, 10 frame hives. E. A. Quivey, Bowen, Illinois.

RANCH TYPE house, bee equipment acreage with water, Leonard Stage, Thomson, Illinois.

USED EXTRACTORS, and used bee equipment of all types. Wally's Bee Enterprise, Inc., Walthill, Nebraska.

FOR SALE: Equipment for 300 hives, 9 drawn combs and feed, also other equipment for production of honey. This is extra clean equipment and disease free. Kenneth Nelson, Harcourt, Iowa.

250-10 frame 2 story hives with bees free from disease $10 each, 1000 5⅜ drawn comb 9 frames with spacers on shallow supers at $2.50 each. Mel Ott, Forest City, Illinois.

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Improved designs, embodying color, balance, simplicity, and distinction. Please send for free samples & prices.

C. W. AEPPLER COMPANY

Oconomowoc, Wisconsin

HONEY FOR SALE

WHITE CLOVER HONEY in sixties. Ralph Gamber, 911 State, Lancaster, Pa.

SWEET CLOVER honey finest quality in sixties. Sample 25c. William Peacock, Mapleton, Iowa.

WE CAN SUPPLY NICE white honey. Immediate delivery. Russell Smalley. Beaver, Iowa.

NEW FLORIDA TWIN PACK. Two three-pound cans of your choice. Orange Blossom, Tupelo, Gallberry, or Palmetto $3.00 postpaid. Phillips Honey Co., P. O. Box 1506, Clearwater, Fla.

WHITE CLOVER honey in new or used sixties. Wahls Apiaries, Chenoa, Illinois.

HONEY and BEESWAX WANTED

WANTED—extra white, white and light amber honey in 60 lb. cans. Cloverdale Honey Co., Fredonia, New York.

WANTED—Extra white and light amber honey. Let us ship you the containers. Sell us your honey for CASH on delivery. The Hubbard Apiaries, Manufacturers of Bee Supplies and Comb Foundation, Onsted, Mich.

HONEY AND Beeswax wanted. Melford Olson Honey Co., 5201 Douglas Drive, Minneapolis 22, Minnesota.

ALL GRADES extracted honey in 60 lb. cans or 600 lb. drums. Prairie View Honey Co. 12303 12th St., Detroit 6, Michigan.

WRITE FOR SHIPPING TAGS and current quotations on rendered beeswax. Any amount from one pound up bought. If you have 25 pounds or more, save 25% by letting us work it into foundation for you. Walter T. Kelley Co., Clarkson, Ky.

EXTRACTED HONEY wanted. Please contact Russell Smalley, Beaver, Iowa.

BEFORE you sell your honey or buy your honey containers see HUBBARD APIARIES, ONSTED, MICHIGAN.

WANTED—Light amber honey in 60 lb. cans or 600 lb. drums. Large and small lots. References furnished. Cloverland Products, 6314 West Patterson Avenue, Chicago 34, Ill.

SUPPLIES

WRITE FOR CATALOGUE. Quality bee supplies at factory prices. Prompt shipment. Satisfaction guaranteed. The Hubbard Apiaries, Manufacturers of Beekeepers' Supplies, Onsted, Michigan.

THE BIGGEST BEE SUPPLY CATALOGUE PUBLISHED (64 pages) free for the asking. Big factory manufacturing a complete line of wooden goods, comb foundation, metal goods, veils and gloves, carloads in stock, daily shipments. WALTER T. KELLEY CO., CLARKSON, KY.

LARGE BEE SUPPLY Manufacturer & Honey Processor wants Supply Dealers & Honey Buyers. Write for Catalog and Honey Prices. Hubbard Apiaries, Onsted, Michigan.

NEW PINE SUPERS (without metal frame rests) $1.15, 9⅛" frames with 19" heavy top bar, $75.00 per M. Will ship. Bockhaus Industries, Pagosa Springs, Colorado.

SPECIAL DESIGNS OF EXTRACTORS, Brand Melters, or other equipment should be ordered in the next few months before the spring rush comes. Hodgson Bee Supplies Ltd., New Westminster, British Columbia.

QUALITY PINE reversible bottom boards $ .85, flat top covers $ .85, division board feeders $ .75. Bee Maid Mfg. Co., P.O. Box 61, Beloit, Wisconsin.

No. 1 Hive Bodies at $2.00, No. 2 Hive Bodies at $1.75, Covers and Bottom Boards at $1.10, Shallow Extracting Supers at $1.25. Hoffman full depth frames (per hundred) $11.00. Catalog on request. Hagen-Lunceford Mfg. & Supply Co., 2500 N. 4th St., Coeur d'Alene, Idaho.

$$$$ SAVE ON BEE SUPPLIES. Write for free catalog and compare prices. Our prices are direct to you the consumer, no middle man involved. Kehm Bros. Apiaries, Rt. No. 1, Box 346, Grand Island, Nebraska.

If you have not received our free 1961 complete Bee Supply Catalog at manufacturer's prices, write Hubbard Apiaries, Onsted, Michigan.

POSITIONS and HELP WANTED

WANTED ONE or TWO men willing to work bees on shares or wages. HUBBARD APIARIES, ONSTED, MICHIGAN.

WANTED: Experienced helper for season. Write stating age, experience, reference, wages expected, etc. Soder Apiaries, Stratford, Iowa.

WANTED: Experienced man for bees or queens in Louisiana and honey production North. HOPKINS HONEY FARMS, MARINGOUIN, LOUISIANA.

38, married beeman in Canada wants permanent position, good worker and reference. Write Box AH, American Bee Journal.

SITUATION wanted in Apicultural work, some beekeeping experience. Seasonal or steady. Otto Bivins, R. R. No. 5, Sullivan, Indiana.

WANTED 2 men with some experience to work in our apiaries, 5 day work week. Top wages. Schultz Honey Farms, Ripon, Wisconsin.

EXPERIENCED man needed to help with honey production, South Dakota. Best Wages. McClain, 12491 Lacey, Hanford, California.

WANTED

WANTED: Small and large lots of bees and equipment, including extractors. Hubbard Apiaries, Onsted, Michigan.

WANTED large outfit in the Midwest. Prefer lease, might buy. Can handle wintered or package operation. Box HWJ, c/o American Bee Journal.

TO LEASE 50 colonies of bees and equipment in central Minnesota. Arno Mahaffey, Isanti, Minn.

BEE OUTFITS any size or locations. Wally's Bee Enterprise, Inc., Walthill, Nebraska.

WANTED BEES or equipment Nebraska Panhandle or nearby. Frank Shaw, Brighton, Colorado.

WANTED TO BUY or lease bees in Midwest. Floyd Stumph, 493 Woodland Ave., Mansfield, Ohio.

WANTED: A complete production unit consisting of up to 2,000 standard colonies and extracting equipment. List condition, specifications and price with first reply. John Sandgun, Bathgate, North Dakota.

WANTED—50 to 500 colonies within 500 miles of Freeport. Cloverland Products, Route 2, Freeport, Illinois.

SEEDS AND PLANTS

100 Thornless honey locust seeds $1.00. Edwin Hunecke, Frontenac, Minnesota.

HONEY PLANTS—ask for illustrated 1961 catalog. Vitex negundo, long blooming nectar shrub, 4 plants $2.50; seed, one packet each—five unusual honey plants, $1.00; postpaid. Pellett Gardens, Atlantic, Iowa.

MISCELLANEOUS

WILL TRADE package bees for late model truck, or experienced beekeeper January till May. Walt Foster, P.O. Box 114, Davis, California.

BEES REMOVED FROM house or tree to hive without touching either house or bees. Bees will then move honey into hive. Save property, honey and bees with my method. Send $2.00 for details. Satisfaction guaranteed. George Hawkins, Rt. 1, Lawson, Mo.

INDIAN BEE JOURNAL, know interesting facts concerning the Honey Bees of India. The only Bee Journal of India published in English. Subscription Rs. 12/- or Sh. 17/6 d (Sterling) or $2.75 per year (INTERNATIONAL M. O.). Sample copy 2s. or 25 cents. Can be had from: The Managing Editor, Indian Bee Journal, Nainital, U. P., India.

RENDERING EVERY day in our all new plant. All honey saved from cappings. Rendering slumgum and old combs. Write for free shipping tags and rates, Hubbard Apiaries, Onsted, Michigan.

RANCH MAGAZINE—Do you find it difficult to secure information about sheep and sheep ranching methods? The SHEEP AND GOAT RAISER reaches more sheepmen with more information of range sheep than any magazine published. Subscription 1 yr., $3.00; sample copy 25c. Box 189, San Angelo, Texas.

The Australasian Beekeeper—The senior beekeeping journal of the Southern Hemisphere provides a complete cover of all beekeeping topics in one of the world's largest honey producing countries. Published monthly by Pender Bros. Pty. Ltd., Box 20, P.O. Maitland, 3N, N.S.W., Australia. Subscription by Bank Draft or International M.O. Australia or New Zealand 16'-($2.00) per annum (in advance) postpaid. British Isles and British Dominions 20'-($2.50) per annum (in advance) postpaid. Other overseas countries 23/-($2.90) per annum (in advance) postpaid.

BEEKEEPERS take honey from hives without smoking or disturbing bees. New patented hive has proven satisfactory. Bees store honey in glass jars ready for market or pantry shelf. Write for details. Dealers wanted for protected territories. See-Bee Mfg. Co., Box 654, Galax, Virginia.

WE BUILD hive loaders, or furnish plans, motors, power units, parts. Gartrell's, 6001 Muldrow Road, Carmichael, California.

FOR SALE

Large all-steel headquarters and extracting building, plus large wooden warehouse for storing thousands of supers. This ready-to-go Honey Plant includes among many other necessary items:

3, 50 frame stainless-steel Extractors, with motors and heating coils.

2, 50 frame Holders for uncapped combs.

2, Stainless-steel Brand Melters.

6, 5,000 lb. stainless steel Honey Tanks

10 frame Extractor.

Brand Uncapper.

McElroy Uncapper.

Large Sump.

Clarifying Tank, stainless-steel with automatic controls.

Gas-fired Steam Boiler with automatic controls.

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J. L. O'FERRELL & SONS

Producers of Queens, Package Bees and Honey
Dadants Midnite Hybrids — Carniolan & Caucasians
409 O'FERRELL STREET
La Belle, Fla. Greensboro, N. C.

PURE FRESH ROYAL JELLY

Quantity	Packages with Midnite Queens 1 - 24	25 - 99	100-up	Packages with Carniolan and Caucasian Queens 1 - 24	25 - 99	100-up
2 lb.	$4.80	$4.55	$4.30	$4.50	$4.25	$4.00
3 lb.	6.00	5.75	5.50	5.70	5.45	5.20
4 lb.	7.20	6.95	6.70	6.90	6.65	6.40
Midnite	$1.75	—EXTRA QUEENS— $1.65	$1.55	Carniolan and Caucasian $1.45	$1.35	$1.25

All tested queens $2.50. Clipped and Marked Queens 10c each.
All queens are mated in isolated mating yards to assure pure breeding. Guaranteed live delivery. Shipping starts first of March.

BOOKING ORDERS FOR 1961

Texas Caucasian Queens and Packages

	1 - 24	25 - 99	100 - up
2 lb. Pkg. with Queen	$4.50	$4.25	$4.00
3 lb. Pkg. with Queen	5.60	5.30	5.00
Queens	1.45	1.35	1.25

All Queens personally produced by J. E. Hastings and his Breeding Stock.
Bred for non-swarming, very gentle, good honey producers.
10% books your order, balance two weeks prior to shipping.
Health Certificate, weight and live arrival guaranteed.
Five cents extra for marking or clipping.

KANE'S APIARIES Route 1 Hallettsville, Texas
Phone SW 8-3039

Offered For First Time

Dadant's New Starline Hybrid Queens ..... $1.75 each
100 up ..... $1.55 each
2 lb. package bees headed with these queens ..... $4.75 each
3 lb. package bees with these queens ..... 5.75 each

These queens have been tested over a 5 year period and have been found to be superior to all previous Hybrids for characteristics such as honey production, gentleness of temper, preparation for winter buildup. This new Hybrid has been tried for extracted, bulk and section comb production and is better than the old hybrid in all types of honey producing colonies.

B.A. ANDERSON Rt. 1 Opp, Ala.
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FOR SALE— 10,000 QUEENS, 2,000 SWARMS ONLY

QUEENS any amount ..... $1.00 each AIR MAIL
2-lb. pkg. with queen ..... 3.50 each exp. collect, not P.P.
3-lb. pkg. with queen ..... 4.50 each exp. collect, not P.P.
Shipping starts about March 25th.

GULF COAST BEE CO., Schriever, Louisiana

Caucasian Queens and Packages

Start the year off right! Place your order now with A. J. York & Son.

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WRITE FOR PRICES

Service Quality
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ITALIANS
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PERSONALLY PAMPERED
QUEENS and PACKAGES
Italian or Caucasian
FRANK POTTORFF
1822 Main St. Delano, Calif.

Homan's Quality Bred Caucasian or Italian
BEES AND QUEENS

2 lb. w/q	$3.75
3 lb. w/q	4.75
4 lb. w/q	5.75
5 lb. w/q	6.75
Queens	$1.15

Write For Reduced Prices After May 20
All Queens Postpaid, Airmail. Health Certificate and Live Arrival Guaranteed.
HOLDER HOMAN
Ph. PO 7-3880, Shannon, Miss.

Italian Package Bees and Queens
JOHN S. SHACKELFORD
RIO OSO, CALIF.
Ph.: Wheatland, Calif.— NEptune 3-2392

25 cents for 8 - 9 oz.
of your honey in our plastic comb honey section
COBANA PROD. CO.
P.O. Box 214 Dearborn 1, Mich.

ITALIAN BEES AND QUEENS
2 lb. pkg. w/q $3.75; 3 lb. pkg. w/q $4.75
4 lb. pkg. w/q $5.75; Queens $1.00
Full weight, safe arrival guaranteed, with health certificate furnished. 10% books your order.
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Caters to both amateur and commercial apiarists.
Subscription $2.00 Per Annum
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Ringwood, Victoria, Australia

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D. T. WINSLETT
7736 Old Auburn Rd.
Citrus Hgts. Calif.

Northern California **QUEENS** Choice Italians

25 or more $1.25 each

24 or less $1.50 each

Also 1000 - 4 Fr. Nucs

SAM E. MOORE

Rt. 2, Box 5566, Anderson, Calif.
Phone CH 3-3010 Redding

Starline Queens and Package Bees
with Starline Queens

	1 to 10	11 to 99	100 up
2 lbs.	$5.00	$4.75	$4.30
3 lbs.	6.10	5.85	5.40
Starline Queens	2.00	1.75	1.55

Package bees F.O.B. here.
Queens prepaid.
Clipping and Marking 10c Extra

C. G. WENNER
Rt. 1, Box 318 - Glenn, Calif.

For Spring 1961
ITALIAN BEES AND QUEENS
3 lbs. w/q $4.10; 4 lbs. w/q $5.00
Live delivery and health certificate guaranteed. 10% books your order. Balance 10 days before shipping date.
Phone Marksville 5520
Your order appreciated.
THE STAR BEE FARM
Adolph Guillory, Prop.
HESSMER LOUISIANA

"THE SCOTTISH BEEKEEPER" (The official organ of the Scottish Beekeepers' Association.) Scottish in character, international in appeal. Annual subscription — $2 post free. Sample copy from Mr. Robert N. H. Skilling, F.S.C.T., 87 King Street, Kilmarnock, Ayrshire, Scotland.

Gentle Yellow Italian Queens
Nothing but the best strain of Italians. Fully laying young queens. Prompt service and satisfaction guaranteed. State health certificate with queens.
QUEENS airmail ..... $1.00 each
MANUEL MAYEUX
Box 102 Hamburg, Louisiana

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Package Bees and Queens
QUALITY & SERVICE
E. H. RYON & SON
Box 46 Durham, Calif.

CAUCASIAN QUEENS
GENTLE
GOOD HONEY PRODUCERS
HERB LIGHT
P.O. Box 77 Colusa, Calif.

Caucasians ★ Midnites ★ Italians
We expect to send you better bees and give better service in 1961.

	1 to 24	25 to 99	100 up
2 lb. Package with queen	$5.00	$4.50	$4.20
3 lb. Package with queen	6.40	5.90	5.40
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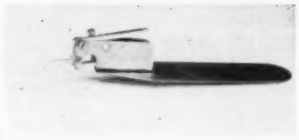

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Crop and Market

by M. G. Dadant

Beekeepers generally throughout the eastern half of the country and all southern sections are well cleared up of honey, with the exception of lots in the hands of a comparatively small number of beekeepers who apparently were waiting for a stiffening in the market, only to have the disappointment of an easing after the midwinter vacation. Michigan is among those having the most in this particular.

Amber lots of honey in California also have "been low" and it is doubtful whether all honey there will move. As a matter of fact, government estimates on the crop finally will boost the honey crop for the United States up several million pounds.

In general, honey stocks in the hands of beekeepers are non-existent or quite moderate except for the occasional lots mentioned above. In the Canadian provinces, beekeepers have some 1½ million pounds and 2 million pounds in the Cooperative still on hand in Ontario and in Manitoba and beekeepers, together with the Cooperatives, may have as much as four or five million pounds.

PACKERS' STOCKS

The packers undoubtedly were well stocked early in the season at good prices and have been content to run along on their present stocks rather than buy, except on extremely favorable terms. This has weakened the market on honey particularly in view of the fact that some ten million pounds of imported honey has come into the country and half of this amount is from Argentina so it can compete with our better white honeys here. No doubt this has had an effect on the entire market and on the attitude of the buyers. Some few packers are running from hand to mouth but in general we believe most packers feel that they have almost enough to carry them into the new crop season.

CONDITION OF BEES

First, bees generally went into winter quarters with ample young bees and a fairly good stock of honey except in some isolated sections. This usually bodes well for the survival of the colony. However, in the extreme northeastern sections and extending into Quebec and as far south as northern Pennsylvania, there has been almost continuous cold weather for several weeks and the question now is whether the warm weather has come in sufficient time to prevent the dwindling that might occur on account of lack of flight. In other sections of the country apparently there have been flights occasionally and bees have come through in fairly satisfactory condition.

In California, the weather remained cool in the northern areas (and even into southern California) quite late so that the build-up of bees is late and for that reason the colonies may not be in the best condition to meet the orange flow.

This is compared to a similar condition in the southern areas of our country where the northern storms reached far down until at least February. Since then weather has broken nicely and the bees are building up rapidly. Warm weather in Washington and Oregon has made for really too much flight and there is a tendency for bees to have overbred and colonies perhaps will need feeding.

MOISTURE

We all have heard, I assume, of the snowstorms in the northeast sections of the country which have covered pretty well that whole area extending as far south as Virginia and into Pennsylvania and at least the eastern half of New York and some sections of Quebec. Strangely enough, in the balance of Canada, the moisture conditions have not been satisfactory and unless this is changed in the late winter and spring, it is doubtful whether the beekeepers will feel they have had enough moisture for a good average crop.

More than average dry conditions appear imminent across the northern sections of the country, running from Michigan west through Wisconsin, Minnesota, the Dakotas, and into Montana, extending down into Colorado and Nebraska. Similarly, some sections of Missouri are likewise dry.

This is offset probably by better than average conditions for moisture on the southeast coast and extending across the entire southern part of the country, however, with probably not as much moisture in Louisiana and Oklahoma as had been anticipated. Late dry winds have cut the moisture in Oklahoma. New Mexico seems to be above average moisture and this perhaps also applies to Arizona.

The Northwest is quite satisfactory for moisture and this extends fairly well down into California. However, from Fresno southward, moisture has not been sufficient. Some reports are to the effect that two or three inches of moisture so far (February 15) will cover the amount for the year where usually an average runs from 7 to 8 inches. This many mean that the desert areas in southern California may not yield this year even as much as the short crop of last season.

In the intermountain area, the question is whether there will be sufficient moisture in the form of snows to provide for maximum irrigation. With usually ten feet of snow in West Yellowstone, there is hardly a foot now. However, of course, there is still ample time for plenty of snow to fall. Colorado seems to be more or less covered normally although conditions now are on the dry side as they are in Nevada and Utah and up into Idaho.

On the whole, we would say that there are "spattering" conditions this year with both dry and moist areas not too far apart but considerable sections in the North and West featuring too little rather than too much moisture, whereas the East and South seem quite content.

HONEY PLANTS

Honey plants naturally could not be well judged at the time our reports came in for the March issue. It is true, however, that honey plants buried under snow usually come out better than average and this is similarly true even in the eastern areas where many of the plants are flowering trees and shrubs. Good snowy moisture conditions and good early rains are bound to increase the possibilities for a crop. In the central areas, we do not believe it was too dry in the fall so the pastures and legumes were able to go into winter in satisfactory fashion. There has, however, been perhaps a paucity of snow during the winter season but on the other hand naturally there has not been the amount of "heaving" which might take place with freezing and thawing of the alfalfa and clover plants.

On the whole, we believe that honey plants will be about average, perhaps less than average in the dry areas and this applies especially to the western provinces of Canada excepting British Columbia.

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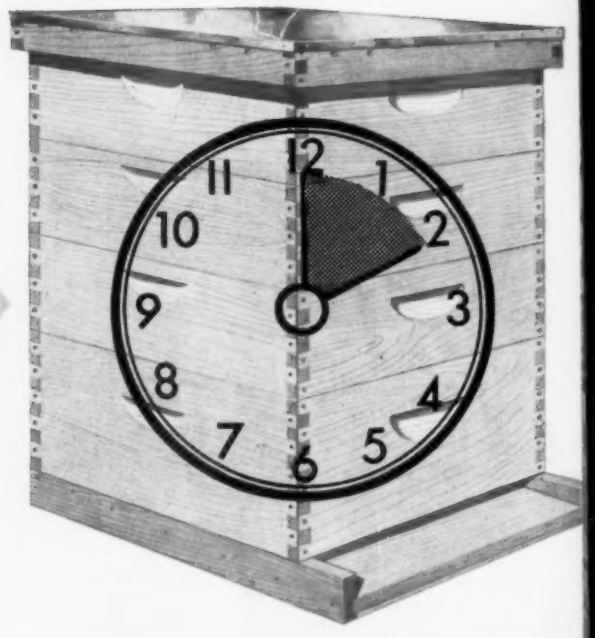

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